BAY AREA AIR QUALITY MANAGEMENT DISTRICT

STAFF REPORT

JUNE 2005

Appendix B

Existing BAAQMD Air Toxics NSR Program Risk Evaluation Procedure (REP) and Risk Management Policy (RMP)

Note: The RMP & REP will be replaced upon adoption of Regulation 2, Rule 5

Risk Evaluation Procedure

(Updated February 3, 2000)

This document describes the procedures to be followed by BAAQMD staff when evaluating health risks for permit applications involving the emission of toxic air contaminants (TACs).

I. All applications for authorities to construct or permits to operate new or modified sources shall be reviewed for emissions of TACs that may result in adverse health effects. The definitions of "new source" and "modified source" given in BAAQMD Regulation 2, Rule 2 shall be used, with the exception that the date of January 1, 1987 shall be used for determining applicability (rather than March 7, 1979).

II. The permit engineer shall identify all TACs emitted from new and modified sources to the extent necessary to determine whether or not they may pose a health risk. Contaminants to be considered are listed in Tables 1 and 2. If the applicant does not provide complete speciation of mixtures being used, the unspeciated fraction of any mixture will be assumed to be the most toxic compound consistent with the available description (e.g., "aromatic compounds" will be assumed to be benzene). The use of nonspecific material codes such as "Other Organic Compounds" or "Hydrocarbon---not specified" shall be avoided.

III. The permit engineer shall calculate annual emission rates for new sources, and the increase in annual emission rates for modified sources, for all emitted TACs listed in Tables 1 and 2. The emission calculation procedures for new and modified sources given in BAAQMD Regulation 2, Rule 2 shall be used. The calculated emission rates shall represent the operation of the source as it is to be described in the permit and any operating conditions associated with the permit.

IV. The total emissions of each applicable TAC from all new and modified sources contained within a permit application shall constitute the "project emissions" for the purpose of determining whether a risk analysis must be prepared. In addition, emission increases from all related projects at the facility shall be included in order to prevent circumvention which might be achieved by breaking a project into smaller pieces and submitting more than one permit application over a period of time. A "related project" shall include all new or modified sources at the facility that have been permitted within the two-year period immediately preceding the date a complete application is received, unless the permit applicant can demonstrate that the sources involved are not directly related to one another (e.g., installation of a groundwater stripper would be directly related to any other remedial activity already occurring, while construction of a new crude unit would not necessarily be directly related to the modernization of a wastewater treatment plant). A "related project" shall also

include a series of consecutive modifications to a single source (e.g., increasing a source's permitted throughput), regardless of the time period over which the modifications occur.

V. A written risk analysis shall be prepared where the project emissions exceed any of the trigger levels listed in Tables 1 and 2. Permit applications not requiring a written risk analysis shall be judged to be in accordance with the BAAQMD's Risk Management Policy and will require no further review.

VI. At the permit engineer's request, staff of the Toxic Evaluation Section will prepare the risk analysis. The application shall not be deemed "complete" until all of the information necessary to perform the risk analysis has been collected. The application shall be forwarded to the Toxic Evaluation Section for review at least two weeks before a completeness determination must be made because additional information may need to be collected in order to perform or refine the analysis.

VII. The evaluating engineer has the option to prepare his/her own risk analysis, provided that it conforms to the procedures laid out in this document. Likewise, an applicant may also submit a conforming analysis. These analyses will be reviewed by the Toxic Evaluation Section for acceptability and amended, if necessary.

VIII. The risk analysis shall be performed in accordance with the risk assessment methodology established for use in the Air Toxics "Hot Spots" Program for estimating maximum individual cancer and chronic non-cancer health risks (ref.1, 2). The current adopted risk assessment guidelines shall be used based on the date of submittal of a complete permit application.

IX. A risk analysis may be performed at one of two levels or tiers. Level 1 is termed a "screening analysis" and Level 2 a "refined analysis". A screening analysis employs procedures and assumptions that assure a conservative estimate of public impact. A refined analysis employs procedures and assumptions that are more site-specific, resulting in a risk evaluation that is more representative of the source in question. The requirements for Level 1 and Level 2 analyses can be found in Appendix B.

X. The risk calculated in a Level 1 analysis tends to overestimate the real risk because of the conservative assumptions used in the process. This approach is satisfactory for the majority of sources and will be utilized routinely by the Toxic Evaluation Section in evaluating permit applications. There are situations, however, in which a Level 2 or refined analysis is preferable. These include the instance in which a screening analysis yields a risk value that exceeds levels given in the Risk Management Policy. In these cases a re-evaluation of the source using a refined analysis may result in a more realistic estimate of risk. The Toxic Evaluation Section will complete refined analyses where feasible, based upon available data and staff resources. The permit applicant also has the option of performing a refined analysis.

In other instances, certain sources/applications will benefit from an immediate Level 2 analysis. Among these are large facilities with multiple sources and/or pollutants, and applications from facilities that may engender public attention because of the nature of their operations or their location in the community. When these cases arise, the Toxic Evaluation Section will recommend that the applicant, or a consultant hired by the applicant, prepare a Level 2 risk analysis. The Toxic Evaluation staff will be available to the applicant or the applicant's consultant to provide oversight in the preparation of the analysis.

XI. All risk analyses shall be reviewed by the Manager of the Toxic Evaluation Section, the District Toxicologist, or another staff member to which this responsibility has been delegated. This review serves the purpose of ensuring that the risk analysis conforms to BAAQMD requirements and that the Risk Management Policy has been followed. This review does not supercede current procedures governing other elements of permit review, such as compliance determination or New Source Review.

XII. It shall be the responsibility of the permit engineer to establish TBACT when required by the Risk Management Policy. The permit engineer shall consult the BACT/TBACT Handbook (ref. 3) for established sources. If TBACT has not been established for the sources being evaluated, the permit engineer shall be responsible for performing a TBACT determination. The Toxic Evaluation Section will be available to assist in the evaluation, if necessary.

Table 1
BAAQMD Screening Levels for Carcinogens
(Updated February 3, 2000)

Compound	Acceptable Emission Rate (lb/year)	Acceptable Air Concentration (gm/m^3)	Unit Risk Factor	Reference
Acetaldehyde	7.2E+01	3.7E-07	2.7E-06	1
Acetamide	9.7E+00	5.0E-08	2.0E-05	4
Acrylamide	1.5E-01	7.7E-10	1.3E-03	2
Acrylonitrile	6.7E-01	3.4E-09	2.9E-04	3
Allyl chloride	3.3E+01	1.7E-07	6.0E-06	3
2-Aminoanthraquinone	2.1E+01	1.1E-07	9.4E-06	4
Aniline	1.2E+02	6.3E-07	1.6E-06	2
Arsenic (inorganic)	2.5E-02♦	1.3E-10♦	3.3E-03	1
Asbestos	3.0E-03	1.6E-11	@@@	1
Benzene	6.7E+00	3.5E-08	2.9E-05	1
Benzidine	1.4E-03	7.1E-12	1.4E-01	3
Benzyl chloride	3.9E+00	2.0E-08	4.9E-05	2
Beryllium	1.4E-02♦	7.4E-11♦	2.4E-03	2
Bis(2-chloro-ethyl)ether	2.7E-01	1.4E-09	7.1E-04	3
Bis(chloro-methyl)ether	1.5E-02	7.7E-11	1.3E-02	3
1,3-Butadiene	1.1E+00	5.9E-09	1.7E-04	1
Cadmium (and compounds)	4.6E-02	2.4E-10	4.2E-03	1
Carbon tetrachloride	4.6E+00	2.4E-08	4.2E-05	1
Chlorinated dibenzodioxins and furans ##	1.2E-06♦	6.2E-15♦	3.8E+01	1
Chlorinated paraffins	7.7E+00	4.0E-08	2.5E-05	4
Chloroform	3.6E+01	1.9E-07	5.3E-06	1
4-Chloro-o-phenylenediamine	4.2E+01	2.2E-07	4.6E-06	4
p-Chloro-o-toluidine	2.5E+00	1.3E-08	7.7E-05	4
Chromium (hexavalent)	1.3E-03	6.7E-12	1.5E-01	1
p-Cresidine	4.4E+00	2.3E-08	4.3E-05	4
Cupferron	3.1+00	1.6E-08	6.3E-05	4
2,4-Diaminoanisole	2.9E+01	1.5E-07	6.6E-06	4
2,4-Diaminotoluene	1.8E-01	9.1E-10	1.1E-03	4
1,2-Dibromo-3-chloropropane	9.7E-02	5.0E-10	2.0E-03	3

Table 1
BAAQMD Screening Levels for Carcinogens
(Updated February 3, 2000)

Compound	Acceptable Emission Rate (lb/year)	Acceptable Air Concentration (gm/m^3)	Unit Risk Factor	Reference
1,4-Dichlorobenzene	1.8E+01	9.1E-08	1.1E-05	3
3, 3′-Dichlorobenzidine	5.6E-01	2.9E-09	3.4E-04	3
1,1-Dichloroethane	1.2E+02	6.3E-07	1.6E-06	4
Diesel exhaust particulate matter	6.4E-01	3.3E-09	3.0E-04	1
Diethylhexylphthalate	8.1E+01	4.2E-07	2.4E-06	5
p-Dimethylaminoazobenzene	1.5E-01	7.7E-10	1.3E-03	4
2,4-Dinitrotoluene	2.1E+00	1.1E-08	8.9E-05	3
1,4-Dioxane	2.5E+01	1.3E-07	7.7E-06	3
Epichlorohydrin	8.3E+00	4.3E-08	2.3E-05	3
Ethylene dibromide	2.7E+00	1.4E-08	7.1E-05	1
Ethylene dichloride	8.7E+00	4.5E-08	2.2E-05	1
Ethylene oxide	2.1E+00	1.1E-08	8.8E-05	1
Ethylenethiourea	1.5E+01	7.7E-08	1.3E-05	4
Formaldehyde	3.3E+01	1.7E--07	6.0E-06	1
Hexachlorobenzene	3.9E-01	2.0E-09	5.1E-04	3
Hexachlorocyclohexanes	1.8E-01	9.1E-10	1.1E-03	3
Hydrazine	3.9E-02	2.0E-10	4.9E-03	2
Lead and lead compounds	1.6E+01	8.3E-08	1.2E-05	1
4.4′-Methylenebis-(2-chloroaniline)	4.4E-01	2.3E-09	4.3E-04	4
Methylene chloride	1.9E+02	1.0E-06	1.0E-06	1
4,4′-Methylenedianiline	4.2E-01	2.2E-09	4.6E-04	4
Michler’s ketone	7.7E-01	4.0E-09	2.5E-04	4
Nickel and Nickel Compounds	7.3E-01	3.8E-09	2.6E-04	1
N-Nitrosodiethylamine	1.9E-02	1.0E-10	1.0E-02	3
N-Nitrosodimethylamine	4.2E-02	2.2E-10	4.6E-03	3
N-Nitrosodiphenylamine	7.3E+01	3.8E-07	2.6E-06	3
p-Nitrosodiphenylamine	3.1E+01	1.6E-07	6.3E-06	4
N-Nitroso-n-dibutylamine	1.6E-03	9.1E-12	1.1E-01	3
N-Nitroso-N-methylethylamine	3.1E-02	1.6E-10	6.3E-03	2
N-Nitrosomorpholine	1.0E-01	5.3E-10	1.9E-03	4

Table 1
BAAQMD Screening Levels for Carcinogens
(Updated February 3, 2000)

Compound	Acceptable Emission Rate (lb/year)	Acceptable Air Concentration (gm/m^3)	Unit Risk Factor	Reference
N-Nitrosopiperidine	7.1E-02	3.7E-10	2.7E-03	4
N-Nitrosodi-*n*-propylamine	9.7E-02	5.0E-10	2.0E-03	2
N-Nitrosopyrrolidine	3.3E-01	1.7E-09	6.0E-04	2
PAHs ***	4.4E-02♦	2.3E-10♦	1.7E-03	1
PCBs	6.8E-03♦	3.5E-11♦	2.2E-03	3
Pentachlorophenol	3.8E+01	2.0E-07	5.1E-06	3
Perchloroethylene	3.3E+01	1.7E-07	5.9E-06	1
Potassium bromate	1.4E+00	7.1E-09	1.4E-04	4
1,3-Propane sultone	2.7E-01	1.4E-09	6.9E-04	4
Propylene oxide	5.2E+01	2.7E-07	3.7E-06	2
1,1,2,2-Tetrachloroethane	3.3E+00	1.7E-08	5.8E-05	2
Thioacetamide	1.1E-01	5.9E-10	1.7E-03	4
2,4- and 2,6-Toluene diisocyanate	1.8E+01	9.1E-08	1.1E-05	4
1,1,2-Trichloroethane	1.2E+01	6.3E-08	1.6E-05	2
Trichloroethylene	9.7E+01	5.0E-07	2.0E-06	1
2,4,6-Trichlorophenol	9.7E+00	5.0E-08	2.0E-05	3
Urethane	6.6E-01	3.4E-09	2.9E-04	3
Vinyl chloride	2.5E+00	1.3E-08	7.8E-05	1

Footnotes for Table 1

Expressed as 2,3,7,8-TCDD equivalents.

*** Includes, but is not limited to, benz[a]anthracene, benzo[a]pyrene, benzo[k]fluoroanthene, benzo[b]fluoroanthene, dibenz[a,h]anthracene, indeno[1,2,3-cd]ppyrene.

♦ Screening levels adjusted to include the impact from default noninhalation pathways.

@@@ URF = 1.9E-04/100 fibers/m^3. Use factor of 100 fibers/0.003 μg weight to convert asbestos concentration in $\mu g/m^3$ to fibers/m^3.

Notes for Table 1

The acceptable air concentration (g/m^3) is the annual average air concentration which would cause a cancer risk of 1E-06 (one in a million). These concentrations are converted to an emission rate (lb/year) by use of the following aerodynamic downwash equation (ref. 6):

Emission rate (g/sec) = 1-hour average concentration (g/m^3) x 1.5 x A x u

Assuming:

1-hour average concentration = annual average concentration x 10 (ref. 7)
A = building cross-sectional area = 92.7 m^2 (25'h x 40'w) [reasonable worst-case assumption]
u = wind speed = 2 m/sec (ref. 8)
Emission rate (lb/year) = emission rate (g/sec) x 69525 (lb/yr)/(g/sec) [units conversion]

Substituting:

Emission rate (lb/year) = [annual avg. concentration (g/m^3) x 10] x [69525 (lb/yr)/(g/s)] x [1.5 x 92.7 m^2 x 2 m/sec]

Yields:

Emission rate (lb/year) = annual average concentration (g/m^3) x 1.93E+08

References for Table 1

1. California/EPA Office of Environmental Health Hazard Assessment (OEHHA), *Air Toxics Hot Spots Program Risk Assessment Guidelines. Part II: Technical Support Document for Describing Available Cancer Potency Factors, April 1999*, Toxic Air Contaminant document.

2. California/EPA Office of Environmental Health Hazard Assessment (OEHHA), *Air Toxics Hot Spots Program Risk Assessment Guidelines. Part II: Technical Support Document for Describing Available Cancer Potency Factors, April 1999*, Integrated Risk Information System (IRIS), US EPA.

3. California/EPA Office of Environmental Health Hazard Assessment (OEHHA), *Air Toxics Hot Spots Program Risk Assessment Guidelines. Part II: Technical Support Document for Describing Available Cancer Potency Factors, April 1999*, Standard Proposition 65 document.

4. California/EPA Office of Environmental Health Hazard Assessment (OEHHA), *Air Toxics Hot Spots Program Risk Assessment Guidelines. Part II: Technical Support Document for Describing Available Cancer Potency Factors, April 1999*, Expedited Proposition 65 document.

5. California/EPA Office of Environmental Health Hazard Assessment (OEHHA), *Air Toxics Hot Spots Program Risk Assessment Guidelines. Part II: Technical Support Document for Describing Available Cancer Potency Factors, April 1999,* Pesticide and Environmental Toxicology Section document.

6. USEPA, Office of Air Quality Planning and Standards, *Screen3 Model User's Guide*, EPA-454/B-95-004, September 1995.

7. USEPA, Office of Air Quality Planning and Standards, *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised*, EPA-454/R-92-019, October 1992.

8. USEPA, Office of Air Quality Planning and Standards, *Regional Workshops on Air Quality Modeling: A Summary Report*, EPA-450/4-82-015, 1982.

Table 2
BAAQMD Screening Levels for Noncarcinogens
(Updated February 3, 2000)

Compound	Acceptable Emission Rate (lb/year)	Acceptable Air Concentration (g/m^3)	Reference
Acrolein	3.9E+00	2.0E-08	2
Allyl chloride	1.9E+02	1E-06	2
Ammonia	1.9E+04	1E-04	2
Benzyl chloride	2.3E+03	1.2E-05	3
Bromine and compounds	3.3E+02	1.7E-06	3
Butyl alcohol, tert-	1.4E+05	7.1E-04	5
Carbon disulfide	1.4E+04	7.4E-05	5
Chlorine	1.4E+03	7.1E-06	3
Chlorobenzene	1.4E+04	7.0E-05	2
Chlorofluorocarbons	1.4E+05	7.0E-04	2
Chlorophenol, 2-	3.5E+03	1.8E-05	2
Chloropicrin	7.7E+02	4.0E-06	3
Chlorotoluene	2.3E+03	1.2E-05	5
Copper and copper compounds	4.6E+02	2.4E-06	3
Cresol mixtures	3.5E+04	1.8E-04	2
1,1-Dichloroethylene; *see* Vinylidene chloride			
Diethylaminoethanol	2.1E+04	1.1E-04	5
Dimethylamine	3.8E+02	2.0E-06	2
Dimethyl phthalate	2.3E+03	1.2E-05	5
Dioctyl phthalate	2.3E+03	1.2E-05	5
Ethyl alcohol (ethanol)	8.7E+05	4.5E-03	5
Ethyl acetate	6.6E+05	3.4E+03	5
Ethyl acrylate	9.3E+03	4.8E-05	3
Ethyl chloride	1.9E+06	1.0E-02	2
Freons: *see* Chlorofluorocarbons			
Gasoline vapors	4.1E+05	2.1E-03	3
Glutaraldehyde	3.3E+02	1.7E-06	3
Glycol ethers:			
2-ethoxyethanol (Cellosolve®)	3.9E+04	2.0E-04	2

Table 2
BAAQMD Screening Levels for Noncarcinogens
(Updated February 3, 2000)

Compound	Acceptable Emission Rate (lb/year)	Acceptable Air Concentration (g/m^3)	Reference
2-ethoxyethanol acetate (Cellosolve® acetate)	1.2E+04	6.4E-05	3
2-methoxymethanol (Methyl Cellosolve®)	3.9E+03	2.0E-05	2
2-methoxymethanol acetate (Methyl Cellosolve® acetate)	1.1E+04	5.7E-05	3
2-butoxyethanol (Butyl Cellosolve®)	3.9E+03	2.0E-05	4
Hexachlorocyclopentadiene	4.6E+01	2.4E-07	2,3
n-Hexane	8.3E+04	4.3E-04	5
Hydrogen bromide	4.6E+03	2.4E-05	3
Hydrogen chloride	1.4E+03	7.0E-06	2
Hydrogen cyanide	1.4E+04	7.0E-05	2
Hydrogen fluoride	1.1E+03	5.9E-06	3
Hydrogen sulfide	8.1E+03	4.2-05	6
Methylene-bis-phenylisocyanate	1.8+01	9.5E-08	3
Methyl isocyanate	7.0E+01	3.6E-07	3
Toluene diisocyanate	1.8+01	9.5E-08	3
Isophorone	6.6E+04	3.4E-04	5
Isopropyl alcohol	4.4E+05	2.3E-03	5
Lead, inorganic, and compounds	2.9E+01*	1.5E-07*	6
Maleic anhydride	4.6E+02	2.4E-06	3
Manganese and manganese compounds	7.7E+01	4.0E-07	2
Mercury and mercury compounds	5.8E+01	3.0E-07	4
Methyl alcohol	1.2E+05	6.2E-04	3
Methyl bromide	1.2E+03	6.0E-06	4
Methyl chloroform (TCA)	6.2E+04	3.2E-04	2
Methylene dianiline & chloride, 4,4'-	3.7E+02	1.9E-06	3
Methyl ethyl ketone	1.5E+05	7.7E-04	1
Methyl mercury	1.9E+02	1.0E-06	2
Methyl methacrylate	1.9E+05	1.0E-04	3
N-Methylpyrrolidone	1.8E+05	9.5E-04	5

Table 2
BAAQMD Screening Levels for Noncarcinogens
(Updated February 3, 2000)

Compound	Acceptable Emission Rate (lb/year)	Acceptable Air Concentration (g/m^3)	Reference
Naphthalene	2.7E+02	1.4E-05	4
Nitric acid	2.3E+03	1.4E-05	5
Nitrobenzene	3.3E+02	1.7E-06	2
Nitropropane, 2-	3.9E+03	2.0E-05	2
Phenol	8.7E+03	4.5E-05	3
Phosgene	1.8E+02	9.5E-07	5
Phosphine	1.9E+03	1.0E-05	2
Phosphoric acid	4.6E+02	2.4E-06	5
Phosphorus (white)	1.4E+01	7.0E-08	2
Phthalic anhydride	1.4E+06	7.0E-03	2
Selenium and selenium compounds	9.7E+01	5.0E-07	3
Silica, respirable, crystalline	2.3E+02	1.2E-06	3
Sodium hydroxide	9.3E+02	4.8E-06	3
Styrene monomer	1.4E+05	7.0E-04	2
Tetrachlorophenols	1.7E+04	8.8E-05	2
Tetrahydrofuran	2.7E+05	1.4E-03	5
Toluene	3.9E+04	2.0E-04	2
Trichlorobenzene, 1,2,4-	1.8E+04	9.5E-05	5
1,1,1-Trichloroethane; *see* Methyl chloroform			
Vapam (Na diethyldithiocarbamate)	2.2E+04	1.1E-04	1
Vinylidine chloride (1,1-Dichloroethylene)	6.2E+03	3.2E-05	2
Xylenes	5.8E+04	3.0E-04	4
Zinc and zinc compounds	6.8E+03	3.5E-05	1

Footnote for Table 2

* Screening levels adjusted to include the impact from default noninhalation pathways

Notes for Table 2

The acceptable air concentration (g/m^3) is the annual average air concentration below which adverse non-cancer health effects are not expected to occur. These concentrations are converted to an emission rate (lb/year) by use of the following aerodynamic downwash equation (ref. 7):

Emission rate (g/sec) = 1-hour average concentration (g/m^3) x 1.5 x A x u

Assuming:

1-hour average concentration = annual average concentration x 10 (ref. 8)
A = building cross-sectional area = 92.7 m^2 (25'h x 40'w) [reasonable worst-case assumption]
u = wind speed = 2 m/sec (ref. 9)
Emission rate (lb/year) = emission rate (g/sec) x 69525 (lb/yr)/(g/sec) [units conversion]

Substituting:

Emission rate (lb/year) = [annual avg. concentration (g/m^3) x 10] x [69525 (lb/yr)/(g/s)] x [1.5 x 92.7 m^2 x 2 m/sec]

Yields:

Emission rate (lb/year) = annual average concentration (g/m^3) x 1.93E+08

References for Table 2

1. Acceptable Daily Intake; EPA Superfund Public Health Evaluation Manual, 1986.

2. California-EPA Office of Environmental Health Hazard Assessment, *CAPCOA Air Toxics "Hot Spots" Program Risk Assessment Guidelines, October 1993*, IRIS database.

3. California-EPA Office of Environmental Health Hazard Assessment, *CAPCOA Air Toxics "Hot Spots" Program Risk Assessment Guidelines, October 1993*, TLV/420.

4. California-EPA Office of Environmental Health Hazard Assessment, *CAPCOA Air Toxics "Hot Spots" Program Risk Assessment Guidelines, October 1993*, EPA Health Effects Assessment Summary Tables, Fourth Quarter FY 1991.

5. Threshold Limit Value (TLV)/Safety factor of 420.

6. California Ambient Air Quality Standard (CAAQS).

7. USEPA, Office of Air Quality Planning and Standards, *Screen3 Model User's Guide,* EPA-454/B-95-004, September 1995.

8. USEPA, Office of Air Quality Planning and Standards, *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised*, EPA-454/R-92-019, October 1992.

9. USEPA, Office of Air Quality Planning and Standards, *Regional Workshops on Air Quality Modeling: A Summary Report*, EPA-450/4-82-015, 1982.

APPENDIX A
REFERENCES

The health risk assessment procedures used by the BAAQMD are in accordance with guidelines adopted by Cal/EPA, specifically the Office of Environmental Health Hazard Assessment (OEHHA), for the Air Toxics "Hot Spots" Program. These guidelines, which are prepared in coordination with the California Air Resources Board (CARB) and the California Air Pollution Control Officers Association (CAPCOA), have been revised several times and are subject to future updating. The current adopted risk assessment guidelines are listed in reference numbers 1 and 2 below.

References:

1. California Air Pollution Control Officers Association, *CAPCOA Air Toxics "Hot Spots" Program, Revised 1992 Risk Assessment Guidelines*, October 1993.

2. Cal/EPA Office of Environmental Health Hazard Assessment Memorandum, *Adoption of Cancer Potency Values for Airborne Toxicants*, April 13, 1999.

3. BACT/TBACT Workbook: Guidelines for Best Available Control Technology including Best Available Control Technology for Toxics (TBACT), June 1995. Periodic updates to Workbook found on the BAAQMD website (www.baaqmd.gov).

APPENDIX B
RISK ANALYSIS PROCEDURES

The Air Toxic "Hot Spots" (ATHS) Program risk assessment guidelines contain detailed discussions on the nature of risk assessments and their preparation. Anyone preparing a risk evaluation for submission to the BAAQMD should consult these guidelines. [It should be noted, however, that the ATHS program involves estimating health risks associated with TAC emissions from entire facilities. The BAAQMD review for new/modified sources involves estimating incremental health risks associated with increases in TAC emissions from proposed projects].

Procedures for Levels 1 and 2 Risk Analyses follow. It should be noted that the ATHS Program risk assessment guidelines use a tiered, iterative, approach to evaluating health risks to allow the level of effort in assessing risk to be commensurate with the importance of the risk management decision. Under this approach, additional detail and refinement in an analysis is introduced only to the extent necessary to reach specified acceptable risk levels.

1. Risk Screening Analysis (Level 1)

A. Components of a Screening Analysis

A screening analysis should contain the following:

1. A brief description of the new or modified source(s).

2. The annual emission estimates associated with the new or modified source(s) for all TACs listed in Tables 1 and 2.

3. A description of applicable emission release parameters such as stack height, stack diameter, stack gas velocity, and release temperature for point sources, or the characteristics of area or volume sources. For elevated emission releases, the dimensions of nearby buildings should also be provided for determining building downwash impacts.

4. The choice of air dispersion model; SCREEN3 or ISCST3 using default meteorological data (i.e., SCREEN3) are the models usually chosen. Any dispersion model selected must be EPA-approved and in the public domain.

5. Identification of the receptors to be impacted by the source being evaluated. This will typically include the closest residential receptor, the closest off-site industrial receptor and any K-12 schools within 1000 feet of the source.

6. The choice of exposure pathways to be evaluated. If the source being evaluated will emit volatile organic compounds (VOC) or other gaseous TACs only, the inhalation pathway is the only pathway that need be evaluated. If the source emits any of the contaminants listed in Table B-1, then noninhalation pathways must also be evaluated. The pathways to be included, in addition to inhalation, are soil ingestion, dermal exposure and mother's milk.

7. An estimate of the zone of impact of the proposed project, if requested by the Toxic Evaluation Section staff. The zone of impact is used to determine whether additional non-inhalation exposure pathways should be evaluated.

B. Results and Calculations

The following items should be included in this portion of the analysis:

1. The results of the air dispersion modeling expressed as the annual average ambient air concentration(s) resulting from the project's emissions ($\mu g/m^3$). The concentrations at the site of maximum impact and at the location of any of the receptors defined in A.6 should be clearly identified.

2. Calculations of risk attributable to emissions of carcinogens and/or calculations of hazard indices attributable to emissions of noncarcinogens. The risk should be calculated for the maximally exposed individual (MEI), which may be either a residential site, an offsite worker, or any K-12 schools within 1000 feet of the source. Sample calculations for risk and hazard index are shown in Appendix C.

   In those instances where noninhalation pathways are included, the risks from these exposure routes should be added to the inhalation risk to give total risk. Similarly, hazard indices are calculated for all of the pathways and summed to give a total hazard index.

3. An adequate map of the facility showing the location of sources, the facility boundary line, all pertinent receptors, and the facility zone of impact (if required).

2. Refined Risk Analysis (Level 2)

A. Components of a Refined Analysis

A refined analysis should contain the following:

1. A description of the new or modified source(s).

2. The annual emission estimates associated with the new or modified source(s) for all TACs listed in Tables 1 and 2.

3. A description of applicable emission release parameters such as stack height, stack diameter, stack gas velocity, and release temperature for point sources, or the characteristics of area or volume sources. For elevated emission releases, the dimensions of nearby buildings should also be provided for determining building downwash impacts.

4. The choice of air dispersion model(s); ISCST3 is the model usually chosen. The reasons for the choice of model should be listed. Any dispersion model selected must be EPA-approved and in the public domain.

5. The choice of meteorological data. The meteorological data must be deemed applicable for the site by BAAQMD meteorologists. For determining cancer risks, the results may be averaged if a minimum of three consecutive years of approved meteorological data is available.

6. The choice of exposure pathways to be evaluated. If the source being evaluated will emit volatile organic compounds (VOC) or other gaseous TACs only, the inhalation pathway is the only pathway that need be evaluated. If the source emits any of the contaminants listed in Table B-1, then noninhalation pathways must also be evaluated. The minimum pathways to be included, in addition to inhalation, are soil ingestion, dermal exposure and mother's milk. Any other pathways that are applicable within the zone of impact of the proposed project (e.g., fish consumption, crop consumption) must also be included.

7. A network of receptor points identified in the modeling analysis. The network should be of sufficient number and density to locate the site of maximum concentration. Receptor points should also be placed at the location of sensitive receptors such as K-12 schools. If required by the Toxic Evaluation Section, receptors should also include census tract (or sub-census area) centroids surrounding the source(s).

8. Identification of the receptors to be impacted by the source being evaluated. This should include the residential and off-site industrial receptors surrounding the source, any K-12 schools located within 1000 feet of the source.

9. An estimate of the zone of impact of the proposed project, if requested by the Toxic Evaluation Section staff. The zone of impact is used to determine whether additional non-inhalation exposure pathways should be evaluated. The zone of impact may also be used to determine which census tracts need to be included in estimating population risks, if deemed necessary by the Toxic Evaluation Section.

B. Results and Calculations

The following items should be included in this portion of the analysis:

1. The results of the air dispersion modeling expressed as the annual average ambient air concentration(s) ($\mu g/m^3$). The concentrations at the site of maximum impact and at the location of any of the receptors defined in A.8 should be clearly identified.

2. Calculations of risk attributable to emissions of carcinogens and/or calculations of hazard indices attributable to emissions of noncarcinogens. The calculations should include the risk to the maximally exposed individual (MEI) and the risks to all of the receptors identified in A.8. Sample calculations for risk and hazard index are shown in Appendix C.

   In those instances where noninhalation pathways are included, the risks from these exposure routes are added to the inhalation risk to give total risk. Similarly, hazard indices are calculated for all of the pathways. The indices for substances affecting the same target organ are summed to give total hazard indices for each target.

3. An adequate map of the facility showing the location of sources, the facility boundary line, all pertinent receptors, and the facility zone of impact (if required).

Table B-1

Substances to be Evaluated for Noninhalation Exposures

Arsenic	Mercury[1]	Polychlorinated biphenyls
Beryllium	Nitrosamines:	PAHs Including, but not limited to:
Cadmium[1]	N-Nitrosodiethylamine	Benz[a]anthracene
Chlorobenzene[1]	N-Nitrosodimethylamine	Benzo[b]fluoranthene
Chromium (hexavalent)	p-Nitrosodiphenylamine	Benzo[k]fluoranthene
Dioxins and Furans	N-Nitrosodi-n-butylamine	Benzo[a]pyrene
2-Chlorophenol[1]	N-Nitrosodi-n-propylamine	Dibenz[a,h]anthracene
p-Dichlorobenzene	N-Nitrosomethylethylamine	Indeno[1,2,3-cd]pyrene
Hexachlorobenzene	N-Nitrosomorpholine	Naphthalene[1]
Hexachlorocyclohexanes	N-Nitrosopiperidine	Pentachlorophenol
Lead[1]	N-Nitrosopyrrolidine	2,4,6 Trichlorophenol

[1] Oral cancer potency value not available.

APPENDIX C
SAMPLE CALCULATIONS

Sample calculations for risk from inhalation exposure only are presented here. Noninhalation exposure risks can be calculated using the equations found in the risk assessment guidelines. Software packages are also available through for estimating risk from both inhalation and noninhalation pathways. They are available through CARB and CAPCOA.

A. Calculation of carcinogenic risk (inhalation pathway)

1) Residential site, 70-year exposure:

Cancer Risk = maximum GLC x URF

2) Off-site worker, long-term exposure:

Cancer Risk = maximum GLC x URF x WEF

GLC = long-term average ground-level air concentration ($\mu g/m^3$)
URF = pollutant-specific unit risk factor $(\mu g/m^3)^{-1}$
WEF = worker exposure factor, long term (varies from 0.14 to 0.66)
If the source emissions occur continuously (i.e., 24 hours/day, 365 days/year), a WEF of 0.14 should be used (8/24 hr x 240/365 days x 46/70 years).
If the source emissions coincide with hours of operation for off-site workers. e.g. weekdays from 8:00 AM to 5:00 PM, rather than continuously, then a WEF of 0.66 should be used (46/70 years).

B. Calculation of noncarcinogenic chronic risk (inhalation pathway)

1) Residential site, long-term exposure:

Hazard Index = maximum GLC/inhalation REL

2) Off-site worker, long-term exposure:

Hazard Index = (maximum GLC/inhalation REL) x WEF

GLC = annual average ground-level air concentration ($\mu g/m^3$)
REL = inhalation reference exposure level ($\mu g/m^3$)
WEF = worker exposure factor, long term (0.22 to 1.0)
If the source emissions occur continuously (i.e., 24 hours/day, 365 days/year), a WEF of 0.22 should be used (8/24 hr x 240/365 days).
If the source emissions coincide with hours of operation for off-site workers. e.g. weekdays from 8:00 AM to 5:00 PM, rather than continuously, no exposure adjustments should be applied (WEF = 1.0).

Risk Management Policy

(Updated February 3, 2000)

The APCO is responsible for Risk Management at the BAAQMD. The APCO may consider a number of factors in determining whether to issue or deny a permit for a proposed project together with the results of a risk analysis. These factors include possible net air quality benefits of replacement equipment, incorporation of all feasible risk reduction measures, the lifetime of the project, the degree of uncertainty in the risk analysis, the costs of mitigation, project benefit to society, or any other relevant factor.

A. The APCO has determined that projects meeting one or more of the following three criteria are acceptable without further risk management consideration:
   i. The project is acceptable if the annual emissions associated with the project would result in an incremental cancer risk equal to or less than 1E-06 (one in a million), were the exposure to continue for 70 years. When applicable, the chronic noncancer risk associated with the project, expressed in terms of a Hazard Index, must be equal to or less than 1.0. The risk is calculated at the point of maximum residential or maximum off-site worker exposure, whichever is greater.
   ii. The project is acceptable if the annual emissions associated with the project would result in an incremental cancer risk greater than 1E-06 (one in a million) and equal to or less than 10E-06 (ten in a million), were the exposure to continue for 70 years, the chronic noncancer risk associated with the project, expressed in terms of a Hazard Index, is equal to or less than 1.0, and TBACT has been applied to permitted sources (TBACT is determined on a case-by-case basis and represents a level of control technology no less stringent than BACT for criteria pollutants; in some cases BACT and TBACT will be equivalent). The risk is calculated at the point of maximum residential or maximum off-site worker exposure, whichever is greater.
   iii. The project is acceptable if it meets any separate criteria for project approval that have been established by the APCO for specific source categories based on risk management considerations.

B. Permit applications not meeting one of the above criteria shall be routed to the APCO with a recommendation for denial. The permit engineer shall collect any additional information regarding the project requested by the APCO that will be considered in the risk management process.

Risk Management Policy for Perc Dry Cleaners

(Updated February 3, 2000)

This document summarizes criteria that have been established by the APCO for approval of permits for new/modified perchloroethylene dry cleaners. These criteria have been established under Section A(iii) of the District's Risk Management Policy based on risk management considerations, and do not supercede any other applicable District Rules and Regulations.

The APCO has determined that proposed projects involving perchloroethylene dry cleaners that meet one or more of the following three criteria are acceptable without further risk management considerations. Risks are to be calculated using the applicable Unit Risk Factor for perchloroethylene at the point of maximum residential or maximum off-site worker exposure, whichever is greater.

A. The project is acceptable if the annual emissions associated with the project would result in an incremental cancer risk equal to or less than 1.0E-06 (one in a million), were the exposure to continue for 70 years.

B. The project is acceptable if: (1) the annual emissions associated with the project would result in an incremental cancer risk greater than 1.0E-06 (one in a million) and equal to or less than 1.0E-05 (ten in a million), were the exposure to continue for 70 years; and (2) TBACT has been applied to permitted sources. TBACT for perchloroethylene dry cleaners is as follows:

   a) TBACT is a Secondary Control Machine for any new installation of a dry cleaning machine (including new facilities, replacement machines, additional machines at existing facilities) or for an increase in the permitted level of solvent emissions, except as follows in item b;

   b) TBACT is a Closed-loop Machine for a relocated machine (a relocation of an existing facility's machine to a new non-residential facility within the District is exempt from secondary control requirements in accordance with Regulation 11-16-104 and the BACT/TBACT Workbook).

C. The project is acceptable if: (1) the annual emissions associated with the project would result in an incremental cancer risk greater than 1.0E-05 (ten in a million) and equal to or less than 1.0E-04 (one hundred in a million), were the exposure to continue for 70 years; and (2) TBACT has been applied to permitted sources; and (3) all reasonable risk reduction measures have been applied. TBACT and all reasonable risk reduction measures for perchloroethylene dry cleaners are as follows:

a) TBACT is a Secondary Control Machine for any new installation of a dry cleaning machine (including new facilities, replacement machines, additional machines at existing facilities) or for an increase in the permitted level of solvent emissions, except as follows in item b;

b) TBACT is a Closed-loop Machine for a relocated machine (a relocation of an existing facility's machine to a new non-residential facility within the District is exempt from secondary control requirements in accordance with Regulation 11-16-104 and the BACT/TBACT Workbook).

c) All reasonable risk reduction measures are: (1) a Vapor Barrier Room (consistent with Regulation 11-16-307.1 and the Dry Cleaner Ventilation Guidelines) for a new facility (including a relocated facility); or (2) an enhanced ventilation system (consistent with Regulation 11-16-307.2 and the Dry Cleaner Ventilation Guidelines, i.e., Vapor Barrier Room, Vapor Capture Room, Partial Vapor Room, or Local Ventilation System) for a proposed project at an existing facility that is not co-residential.

A permit applicant may apply alternative and/or additional emissions control (e.g., secondary control retrofits for relocated machines, use of alternative solvents) or other risk reduction measures (e.g., increasing stack height and/or exit velocity) as necessary to reduce risks to acceptable levels specified in one of the three listed criteria above.

Permit applications not meeting one of the above criteria shall be routed to the APCO with a recommendation for denial. The permit engineer shall collect any additional information regarding the project requested by the APCO that will be considered in the risk management process.

Risk Management Policy for Diesel-Fueled Engines

(Updated January 11, 2002)

This document summarizes criteria that have been established by the APCO for approval of permits for new/modified diesel-fueled, reciprocating, engines ("diesel-fueled engines"). These criteria have been established under Section A(iii) of the District's Risk Management Policy based on risk management considerations, and do not supercede any other applicable District Rules and Regulations. Definitions of key terms used in this policy shall be consistent with those given in Risk Management Policy for Permitting of New Stationary Diesel-Fueled Engines, California Air Resources Board, October 2000.

The APCO has determined that proposed projects with permitted diesel-fueled engines meeting one or more of the following two criteria are acceptable without further risk management considerations. Risks are to be calculated using the applicable Unit Risk Factor for diesel particulate matter (PM) at the point of maximum residential or maximum off-site worker exposure, whichever is greater. For emergency standby engines, risks are to be calculated for all engine operation excluding emergency use (as defined in Regulation 9-8-231).

A. The project is acceptable if the annual emissions associated with the project would result in an incremental cancer risk equal to or less than 1.0E-06 (one in a million), were the exposure to continue for 70 years.

B. The project is acceptable if: (1) the annual emissions associated with the project would result in an incremental cancer risk greater than 1.0E-06 (one in a million) and equal to or less than 1.0E-05 (ten in a million), were the exposure to continue for 70 years; and (2) TBACT has been applied to permitted sources. TBACT for diesel-fueled engines is as follows:

   a) TBACT is a low emitting, spark-ignited, gas-fueled engine with lean burn combustion or rich burn with Non-Selective Catalytic Reduction (see District's *BACT/TBACT Workbook*). A diesel-fueled engine will be permitted only if a gas-fueled engine, or electric motor, is not practical (e.g., a remote location without natural gas availability or electric power, the engine is to be used exclusively for emergency standby purposes, or only a diesel-fueled engine will meet the portability and/or power/torque/rpm requirements of the application under review).

   b) If a diesel-fueled engine is shown by the permit applicant to be necessary, then TBACT is a CARB or EPA certified engine with a PM certified level (or equivalent emission rate) no greater than 0.1 g/bhp-hr.[1]

A permit applicant may apply alternative and/or additional emissions control (e.g., catalyst-based diesel particulate filters (DPFs), diesel oxidation catalysts, ultra-low sulfur diesel fuel) or other risk reduction measures (e.g., increasing stack height within what is considered Good Engineering Practice, maximizing source/receptor separation distances, modifying operating hours to minimize public exposure) as necessary to reduce risks to acceptable levels specified in one of the two listed criteria above (A or B). All engines not equipped with a DPF must be "plumbed" to facilitate the installation of a DPF at a future date.

Permit applications not meeting one of the above criteria shall be routed to the APCO with a recommendation for denial. The permit engineer shall collect any additional information regarding the project requested by the APCO that will be considered in the risk management process.

FOOTNOTE:

[1] A PM certified level no greater than 0.1 g/bhp-hr means an emission level of 0.15 g/bhp-hr or less as determined during a steady-state engine certification test (ISO 8178).

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Staff Report

JUNE 2005

Appendix C

Methodology for Derivation of Toxic Air Contaminant (TAC) Trigger Levels

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
939 ELLIS STREET
SAN FRANCISCO, CA 94109

Methodology for Derivation of Toxic Air Contaminant (TAC) Trigger Levels

C1. INTRODUCTION

The TAC trigger levels given in Table 2-5-1 are used to determine the need for a health risk screening analysis (HRSA) for projects involving new and modified sources. The TAC trigger levels are also used: (1) to establish permit requirements for certain sources that may otherwise qualify for permit exemptions, (2) as part of the applicability of the accelerated permit program, and (3) in determining permit fees. The TAC trigger levels are considered to be reasonable de minimis emission rates for use at a project-level. Projects with emissions below the TAC trigger levels are unlikely to cause, or contribute significantly to, adverse health risks.

The TAC trigger levels were calculated using: (1) target health risk levels that are considered de minimis for project-level risks, (2) OEHHA/ARB health effect values, (3) generally conservative modeling procedures which establish the extent to which a TAC is transported and dispersed in the atmosphere after its release from the source, and (4) health-protective assumptions regarding the extent of an individual's exposure to an emitted TAC.

C2. Target Health Risk Levels

For chronic health risk, a lifetime cancer risk of 1.0 in a million (10^{-6}) and a non-cancer hazard index of 0.20, were used as the target health risk levels to derive the chronic trigger levels. These are the risk thresholds at which TBACT is required under Regulation 2, Rule 5. The target cancer risk is unchanged from what was used to derive the trigger levels in the existing REP. The target non-cancer health risk is 20 percent of what was used to derive the trigger levels in the existing REP (i.e., these were based on a target hazard index of 1.0).

Where applicable, the chronic trigger level represents the lesser of the trigger levels determined based on the cancer and non-cancer target health risk levels. In general, for compounds that have both potential cancer and non-cancer adverse health effects, the chronic trigger level presented in Table 2-5-1 is based on the potential carcinogenic health effect, which is more health-protective.

For acute health risk, a hazard index of 1.0 was used as the target health risk level. This is an impact equal to the acute REL, which represents an air concentration that is not likely to cause adverse effects in a human population, including sensitive subgroups, exposed on an intermittent basis for a one-hour period. It is also the project risk limit required under Regulation 2, Rule 5. The acute trigger levels in Table 2-5-1 are new; the existing REP contains only chronic trigger levels.

C3. Health Effect Values

Table 2-5-1 incorporates the most recent health effect values adopted by OEHHA/ARB (as of January 1, 2005) for use in the ATHS Program. These include CPFs for carcinogens, and RELs for non-carcinogenic health effects. Some TACs do not appear on Table 2-5-1 because there may not be sufficient data available for OEHHA to establish a CPF or REL. Prior to use in Regulation 2, Rule 5, the District through a rule development process will review any new or revised health effects value adopted by OEHHA/ARB after January 1, 2005. Typically within one year of OEHHA/ARB's adoption of new toxicity criteria, the District will evaluate the new criteria for feasibility of implementation, enforcement, and compliance with project risk limits.

Although OEHHA has provided RELs for CO, NO2, and SO2, using the State Ambient Air Quality Standards, trigger levels were not developed for these criteria pollutants because they are regulated in other District programs. In addition, although OEHHA has developed toxicity criteria for "gasoline vapors", a trigger level was not developed for this compound grouping because individual components of gasoline (e.g., benzene) are evaluated separately. Moreover, gasoline has been reformulated since the development of the REL for gasoline vapors, so the use of this REL is considered outdated.

The trigger levels for polycyclic aromatic hydrocarbons (PAHs), polychlorinated dibenzo-p-dioxins (PCDDs, or dioxins), polychlorinated dibenzofurans (PCDFs, or furans), and dioxin-like polychlorinated biphenyls (PCBs) were based on compound groupings. The trigger levels were expressed as B(a)P-equivalent and TCDD-equivalents in order to address cumulative exposures to applicable PAH and PCDD/PCDF/dioxin-like PCB congeners, respectively.

Although acute severity exposure levels (e.g., mild, severe, and life-threatening effects) have been identified for each acute REL, all acute trigger levels were developed based on the same exposure assumptions and target risk levels, regardless of the severity of the adverse health effect corresponding to the acute REL.

C4. Modeling Procedures

The trigger levels in Table 2-5-1 are based on the same screening-level dispersion modeling procedure that was used to develop the trigger levels in the existing REP. This involves the use of a cavity effects screening procedure that relates emission rate to one-hour average ambient air concentrations (i.e., dispersion factors, or Chi/Q) where dispersion is affected by aerodynamic downwash from a nearby building. The cavity region occurs immediately adjacent to the lee side of the building and is often the "worst-case" dispersion scenario where receptor areas are in close proximity to the source being evaluated. The cavity effects equation used to derive the trigger levels is provided in EPA's Screening Procedures for Estimating the Air Quality Impact of Stationary Sources (EPA, 1992), and is incorporated into the EPA SCREEN3 model (EPA, 1995).

The cavity effects equation requires the selection of the crosswind building area and the average wind speed. A value of 92.7 square meters was used for the crosswind building area (e.g., a building 25 feet high x 40 feet wide). The average wind speed was taken to be 2 meters per second, based on EPA screening modeling guidelines. For use in determining chronic trigger levels, a multiplying factor representing the ratio between annual average and one-hour maximum concentrations of 0.1 was used. This is the high-end value of the range of multiplying factors provided in EPA screening modeling guidelines (EPA, 1982).

All acute trigger levels were conservatively based on maximum one-hour average dispersion factors regardless of the averaging period of the REL. (Most RELs are based on one-hour exposures, but some are based on exposures averaged over several hours [e.g., 4-, 6-, and 7-hour] for reproductive/developmental endpoints).

C5. Exposure Assumptions

The exposure assessment assumptions, that are provided in the 2003 HRA Guidelines, were used to estimate trigger levels. In addition, the District has conformed with the statewide interim Risk Management Policy for inhalation-based residential cancer risk that was adopted by the California Air Resources Board (ARB) and Cal/EPA's OEHHA (http://www.arb.ca.gov/toxics/rmpolicy.pdf). This interim policy recommends where a single cancer risk value for a residential receptor is needed or prudent for risk management decision-making, the potential cancer risk estimate for the inhalation exposure pathway be based on the breathing rate representing the 80th percentile value of the breathing rate range of values (302 L/kg-day). Therefore, the recommended breathing rate of 302 L/kg-day was used to calculate the trigger levels presented in Table 2-5-1. Previously a breathing rate of 286 L/kg-day was used, which was based on a daily respiration rate of 20 cubic meters and a 70 kg body weight. A conservative exposure frequency of 365 days/yr was used, along with an exposure duration of 70 years.

OEHHA has identified a list of substances that require multi-pathway risk analysis, which are listed in Table C-1. The trigger levels for these compounds have been determined based on the minimum residential multi-pathway exposure routes, which are inhalation, incidental soil ingestion, and dermal contact. For dioxins, furans, and PCBs, the breast-milk consumption pathway was also included per OEHHA recommendations. The multi-pathway exposure assessment was performed using CARB's Hotspots Analysis and Reporting Program (HARP) (Version 1.0) using default assumptions. A deposition rate of 0.02 meters per second for "controlled sources" was selected for use in HARP for the multi-pathway risk analyses.

Table C-1 Substances with Trigger Levels Based on Multi-pathway Exposures

Substance	
4,4'-Methylene dianiline	Chromium VI & compounds
Creosotes	Inorganic arsenic & compounds
Diethylhexylphthalate	Beryllium & compounds
Hexachlorocyclohexanes	Lead & compounds
PAHs	Mercury & compounds
PCBs	Nickel & compounds
Cadmium & compounds	Dioxins & Furans

C6. Trigger Level Calculations

The acute trigger levels presented in Table 2-5-1 were calculated as follows:

*Acute TL = Acute REL * 1.5 * A * u * UCF * THI*

where:

Acute TL = Acute Trigger Level (pounds/hour)

Acute REL = Acute Reference Exposure Level (chemical-specific - $\mu g/m^3$)

A = Building Cross-Sectional Area (92.7 m^2),
[25 feet height x 40 feet width x 40 feet length]

u = Wind Speed [2 m/sec]

UCF = Units Conversion Factor, (7.9E-06)
[(lb/453,590,000 μg) * (3,600 sec/hr)]

THI = Target Hazard Index [1.0]

The chronic trigger levels in Table 2-5-1 represent the lesser of the trigger levels calculated for a carcinogenic and non-carcinogenic adverse health effect. Chronic trigger levels based on non-carcinogenic adverse health effects were calculated for the inhalation exposure pathway, and multi-pathway analyses (via HARP) using the following equation:

$$Chronic\ TL_{nc} = Chronic\ REL * 10 * 1.5 * A * u * UCF * THI$$

where:

Chronic TL_{nc} = Chronic Trigger Level – non-cancer risk (pounds/year)

Chronic REL = Chronic Reference Exposure Level (chemical-specific $\mu g/m^3$ where applicable, chronic RELs were adjusted via HARP to include impacts from multi-pathway exposure)

10 = conversion factor used to convert from an annual average concentration to a 1-hour average concentration

A = Building Cross-Sectional Area (92.7 m^2), [25 feet height x 40 feet width x 40 feet length]

u = Wind Speed [2 m/sec]

UCF = Units Conversion Factor (69,525 mg L sec/year m^3), [(lb/453,590 mg) * (1,000 L/m^3) * (31,536,000 sec/year)]

THI = Target Hazard Index [0.2]

Chronic trigger levels based on carcinogenic health effects were calculated for the inhalation exposure pathway, and multi-pathway analyses (via HARP) using the following equation:

$$\textit{Chronic } TL_{cr} = 1 / (CPF * BR * EF * 10 * 1.5 * A * u * UCF * TCR)$$

where:

Chronic TL_{cr} = Chronic Trigger Level – cancer risk (pounds/year)

CPF = Cancer Potency Factor (chemical – specific, $(mg/kg\text{-}day)^{-1}$; where applicable, CPFs were adjusted via HARP to include impacts from multi-pathway exposure)

BR = Breathing Rate (302 L/kg-day)

EF = Exposure Frequency (365 days/year)

10 = conversion factor used to convert from an annual average concentration to a 1-hour average concentration

A = Building Cross-Sectional Area (92.7 m^2), [25 feet height x 40 feet width x 40 feet length]

u = Wind Speed (2 m/sec)

UCF = Units Conversion Factor = (69,525 mg L sec/year m^3), [(lb/453,590 mg) * (1,000 L/m^3) * (31,536,000 sec/year)]

TCR = Target Cancer Risk [10^{-6}]

Table C-2 presents a comparison of the chronic trigger levels listed in the existing REP and Table 2-5-1. Where a difference in trigger level is identified, the basis for the chemical-specific modification is noted. Differences in trigger levels may be due to one or more of the following factors: (1) revised chemical-specific health effects values (e.g., CPFs and/or RELs) in the 2003 HRA Guidelines relative to earlier guideline documents, (2) the use of a revised target hazard index of 0.2 (rather than 1.0 used in the REP) for non-cancer risks, (3) changes in default multi-pathway exposure parameters or calculations included in HARP relative to the CARB HRA Program (which was previously used), (4) change in the assumed breathing rate of 302 L/kg-day (rather than 286 L/kg-day), and/or (5) the use of cancer potency factors instead of unit risk factors in the calculation of trigger levels. With respect to the last factor, the trigger levels in the REP (for carcinogens) were calculated using unit risk factors, whereas the trigger levels in Table 2-5-1 were calculated based on cancer potency factors (as now recommended by OEHHA). In general, if a chemical-specific unit risk factor and CPF are derived from the same data, they represent the same value, but are only expressed in different units of measure [unit risk factors are expressed as $(\mu g/m^3)^{-1}$ and assume a daily breathing rate of 20 m^3 and body weight of 70 kg; CPFs are expressed as $(mg/kg\text{-}day)^{-1}$]. However, slight differences can be introduced when the values are rounded for presentation in tables. Therefore, although a chemical-specific health effect value may not have been revised, the use of the CPF instead of the URF may result in a difference in the trigger level of up to about six percent.

Table C-2 Summary of Chronic Trigger Level Revisions

Chemical	Chronic Trigger Levels (pounds/year)		Change from REP[a]	Notes
	REP[a]	Table 2-5-1[b]		
Acetaldehyde	7.2E+01	6.4E+01	-11%	i, k
Acetamide	9.7E+00	9.1E+00	-6%	k
Acrolein	3.9E+00	2.3E+00	-41%	a, b
Acrylamide	1.5E-01	1.4E-01	-7%	k
Acrylic acid	NA	3.9E+01	NA	
Acrylonitrile	6.7E-01	6.4E-01	-4%	i, k
Allyl chloride	3.3E+01	3.0E+01	-9%	i, k
Aminoanthraquinone, 2-	2.1E+01	1.9E+01	-10%	i, k
Ammonia	1.9E+04	7.7E+03	-59%	a, b
Aniline	1.2E+02	3.9E+01	-68%	g
Antimony compounds	NA	7.7E+00	NA	
antimony trioxide	NA	7.7E+00	NA	
Arsenic and compounds (inorganic)	2.5E-02	1.2E-02	-52%	h
Arsine	NA	1.9E+00	NA	
Asbestos	3.0E-03	2.9E-03	-3%	k
Benzene	6.7E+00	6.4E+00	-4%	i, k
Benzidine (and its salts)	1.4E-03	1.3E-03	-7%	k
benzidine based dyes	NA	1.3E-03	NA	
direct black 38	NA	1.3E-03	NA	
direct blue 6	NA	1.3E-03	NA	
direct brown 95 (technical grade)	NA	1.3E-03	NA	
Benzyl chloride	3.9E+00	3.8E+00	-3%	i, k
Beryllium and compounds	1.4E-02	8.0E-02	+471%	h, j, k
Bis(2-chloroethyl)ether (Dichloroethyl ether)	2.7E-01	2.6E-01	-4%	k
Bis(chloromethyl)ether	1.5E-02	1.4E-02	-7%	k
Bromine and compounds	3.3E+02	6.6E+01	-80%	a
bromine pentafluoride	NA	6.6E+01	NA	
hydrogen bromide	4.6E+03	9.3E+02	-80%	a
potassium bromate	1.4E+00	1.3E+00	-7%	k
Butadiene, 1,3-	1.1E+00	1.1E+00	None	
Cadmium and compounds	4.6E-02	4.5E-02	-2%	i
Carbon disulfide	1.4E+04	3.1E+04	+121%	a, b, d
Carbon tetrachloride (Tetrachloromethane)	4.6E+00	4.3E+00	-7%	i, k
Chlorinated paraffins	7.7E+00	7.2E+00	-6%	i, k
Chlorine	1.4E+03	7.7E+00	-99%	a, c
Chlorine dioxide	NA	2.3E+01	NA	
Chloro-o-phenylenediamine, 4-	4.2E+01	4.0E+01	-5%	k
Chloroacetophenone, 2-	NA	1.2E+00	NA	
Chlorobenzene	1.4E+04	3.9E+04	+179%	a, b
Chlorodifluoromethane (Freon 22) [see Fluorocarbons]				

Chemical	Chronic Trigger Levels (pounds/year)		Change from REP[a]	Notes
	REP[a]	Table 2-5-1[b]		
Chlorofluorocarbons [see Fluorocarbons]				
Chloroform	3.6E+01	3.4E+01	-6%	k
Chlorophenol, 2-	3.5E+03	7.0E+02	-80%	a
Chloropicrin	7.7E+02	1.5E+01	-98%	a, c
Chloroprene	NA	3.9E+01	NA	
Chloro-o-toluidine, p-	2.5E+00	2.4E+00	-4%	k
Chromium, (hexavalent, 6+)	1.3E-03	1.3E-03	None	
barium chromate	NA	1.3E-03	NA	
calcium chromate	NA	1.3E-03	NA	
lead chromate	NA	1.3E-03	NA	
sodium dichromate	NA	1.3E-03	NA	
strontium chromate	NA	1.3E-03	NA	
Chromium trioxide (as chromic acid mist)	NA	1.3E-03	NA	
Copper and compounds	4.6E+02	9.3E+01	-80%	a
Cresidine, p-	4.4E+00	4.3E+00	-2%	i, k
Cresols (m-, o-, p-)	3.5E+04	2.3E+04	-34%	a, b
Cupferron	3.1E+00	2.9E+00	-6%	k
Cyanide and compounds (inorganic)	NA	3.5E+02	NA	
hydrogen cyanide (hydrocyanic acid)	1.4E+04	3.5E+02	-98%	a, c
Diaminoanisole, 2,4-	2.9E+01	2.8E+01	-3%	k
Diaminotoluene, 2,4-	1.8E-01	1.6E-01	-11%	i, k
Dibromo-3-chloropropane, 1,2- (DBCP)	9.7E-02	9.1E-02	-6%	k
Dichlorobenzene, 1,4-	1.8E+01	1.6E+01	-11%	i, k
Dichlorobenzidine, 3,3-	5.6E-01	5.3E-01	-5%	k
Dichloroethane, 1,1- (Ethylidene dichloride)	1.2E+02	1.1E+02	-8%	i
Dichloroethylene, 1,1- [see vinylidene chloride]				
Diesel exhaust particulate matter	6.4E-01	5.8E-01	-9%	i, k
Diethanolamine	NA	1.2E+02	NA	
Di(2-ethylhexyl)phthalate (DEHP)	8.1E+01	6.9E+01	-15%	h, i, k
Dimethylamine	3.8E+02	7.7E+01	-80%	a
Dimethylaminoazobenzene, p-	1.5E-01	1.4E-01	-7%	k
Dimethyl formamide, N,N-	NA	3.1E+03	NA	
Dinitrotoluene, 2,4-	2.1E+00	2.1E+00	None	
Dioxane, 1,4- (1,4-diethylene dioxide)	2.5E+01	2.4E+01	-4%	k
Epichlorohydrin (1-chloro-2,3-epoxypropane)	8.3E+00	8.0E+00	-4%	i, k
Epoxybutane, 1,2-	NA	7.7E+02	NA	
Ethyl acrylate	9.3E+03	1.9E+03	-80%	a
Ethyl benzene	NA	7.7E+04	NA	
Ethyl chloride (chloroethane)	1.9E+06	1.2E+06	-37%	a, b
Ethylene dibromide (1,2-dibromoethane)	2.7E+00	2.6E+00	-4%	k
Ethylene dichloride (1,2-dichloroethane)	8.7E+00	8.9E+00	+2%	e, i, k
Ethylene glycol	NA	1.5E+04	NA	
Ethylene glycol butyl ether – EGBE [see Glycol ethers]				

Chemical	Chronic Trigger Levels (pounds/year)		Change from REP[a]	Notes
	REP[a]	Table 2-5-1[b]		
Ethylene oxide (1,2-epoxyethane)	2.1E+00	2.1E+00	None	
Ethylene thiourea	1.5E+01	1.4E+01	-7%	k
Fluorides and compounds	NA	5.0E+02	NA	
hydrogen fluoride (hydrofluoric acid)	1.1E+03	5.4E+02	-51%	a, b
Fluorocarbons (chlorinated)	1.4E+05	2.7E+04	-81%	a
chlorinated fluorocarbon (CFC-113)	1.4E+05	2.7E+04	-81%	a
chlorodifluoromethane (Freon 22)	NA	1.9E+06	NA	
dichlorofluoromethane (Freon 21)	NA	2.7E+04	NA	
trichlorofluoromethane (Freon 11)	NA	2.7E+04	NA	
fluorocarbons (brominated)	NA	2.7E+04	NA	
Formaldehyde	3.3E+01	3.0E+01	-9%	i, k
Freons [see Fluorocarbons]				
Glutaraldehyde	3.3E+02	3.1E+00	-99%	a, c
Glycol ethers				
ethylene glycol butyl ether – EGBE (2-butoxy ethanol; butyl cellosolve)	3.9E+03	7.7E+02	-80%	a
ethylene glycol ethyl ether – EGEE (2-ethoxy ethanol; cellosolve)	3.9E+04	2.7E+03	-93%	a, c
ethylene glycol ethyl ether acetate – EGEEA (2-ethoxyethyl acetate; cellosolve acetate)	1.2E+04	1.2E+04	None	
ethylene glycol methyl ether – EGME (2-methoxy ethanol; methyl cellosolve)	3.9E+03	2.3E+03	-41%	a, b
ethylene glycol methyl ether acetate – EGMEA (2-methoxyethyl acetate; methyl cellosolve acetate)	1.1E+04	3.5E+03	-68%	a, b
Hexachlorobenzene	3.9E-01	3.6E-01	-8%	i, k
Hexachlorocyclohexanes (mixed or technical grade)	1.8E-01	1.2E-01	-33%	h
Hexachlorocyclohexane, alpha-	NA	1.2E-01	NA	
Hexachlorocyclohexane, beta-	NA	1.2E-01	NA	
Hexachlorocyclohexane, gamma- (lindane)	NA	4.2E-01	NA	
Hexachlorocyclopentadiene	4.6E+01	9.3E+00	-80%	a
Hexane, n-	8.3E+04	2.7E+05	+225%	a,b,d
Hydrazine	3.9E-02	3.8E-02	-3%	i, k
Hydrochloric acid (hydrogen chloride)	1.4E+03	3.5E+02	-75%	a, b
Hydrogen bromide [see bromine & compounds]				
Hydrogen cyanide (hydrocyanic acid) [see cyanide & compounds]				
Hydrogen fluoride (hydrofluoric acid) [see fluorides & compounds]				
Hydrogen sulfide	8.1E+03	3.9E+02	-95%	a, c
Isophorone	6.6E+04	7.7E+04	+17%	a, b, d
Isopropyl alcohol (isopropanol)	4.4E+05	2.7E+05	-39%	a, b, d
Lead and compounds (inorganic)	1.6E+01	5.4E+00	-66%	f, k
lead acetate	NA	5.4E+00	NA	
lead phosphate	NA	5.4E+00	NA	
lead subacetate	NA	5.4E+00	NA	

Chemical	Chronic Trigger Levels (pounds/year)		Change from REP[a]	Notes
	REP[a]	Table 2-5-1[b]		
Lindane [see hexachlorocyclohexane, gamma]				
Maleic anhydride	4.6E+02	2.7E+01	-94%	a, c
Manganese and compounds	7.7E+01	7.7E+00	-90%	a, c
Mercury and compounds (inorganic)	5.8E+01	5.6E-01	-99%	a, c
mercuric chloride	NA	5.6E-01	NA	
Mercury and compounds (organic)				
methyl mercury	1.9E+02	3.9E+01	-79%	a
Methanol (methyl alcohol)	1.2E+05	1.5E+05	+25%	a, b
Methyl bromide (bromomethane)	1.2E+03	1.9E+02	-84%	a, c
Methyl chloroform (1,1,1-trichloroethane)	6.2E+04	3.9E+04	-37%	a, b
Methyl ethyl ketone (MEK) (2-butanone)	1.5E+05	3.9E+04	-74%	a, b
Methyl isocyanate	7.0E+01	3.9E+01	-44%	a, b
Methyl mercury [see mercury & compounds]				
Methyl methacrylate	1.9E+05	3.8E+04	-80%	a
Methyl tertiary-butyl ether (MTBE)	NA	3.6E+02	NA	
Methylene bis (2-chloroaniline), 4,4'- (MOCA)	4.4E-01	4.3E-01	-2%	i, k
Methylene chloride (dichloromethane)	1.9E+02	1.8E+02	-5%	k
Methylene dianiline, 4,4'- (and its dichloride)	4.2E-01	4.1E-01	-2%	i
Methylene diphenyl isocyanate	1.8E+01	2.7E+01	+50%	a, b
Michler's ketone (4,4'-bis(dimethylamino)benzophenone)	7.7E-01	7.4E-01	-4%	i, k
Mineral fibers (<1% FREE SILICA)	NA	9.3E+02	NA	
ceramic fibers (man-made)	NA	9.3E+02	NA	
glasswool (man-made fibers)	NA	9.3E+02	NA	
mineral fibers (fine: man-made)	NA	9.3E+02	NA	
rockwool (man-made fibers)	NA	9.3E+02	NA	
slagwool (man-made fibers)	NA	9.3E+02	NA	
Naphthalene [see polycylcic aromatic hydrocarbons]				
Nickel and compounds	7.3E-01	7.3E-01	None	
nickel acetate	NA	7.3E-01	NA	
nickel carbonate	NA	7.3E-01	NA	
nickel carbonyl	NA	7.3E-01	NA	
nickel hydroxide	NA	7.3E-01	NA	
nickelocene	NA	7.3E-01	NA	
nickel oxide	NA	7.3E-01	NA	
nickel refinery dust from the pyrometallurgical process	NA	7.3E-01	NA	
nickel subsulfide	NA	7.3E-01	NA	
Nitric acid	2.3E+03	NA	NA	
Nitrobenzene	3.3E+02	6.6E+01	-80%	a
Nitropropane, 2-	3.9E+03	7.7E+02	-80%	a
Nitroso-n-dibutylamine, N-	1.6E-03	5.8E-02	+3,525%	e, i, k *
Nitrosodi-n-propylamine, n-	9.7E-02	9.1E-02	-6%	k
Nitrosodiethylamine, n-	1.9E-02	1.8E-02	-5%	k

Chemical	Chronic Trigger Levels (pounds/year)		Change from REP[a]	Notes
	REP[a]	Table 2-5-1[b]		
Nitrosodimethylamine, n-	4.2E-02	4.0E-02	-5%	k
Nitrosodiphenylamine, n-	7.3E+01	7.1E+01	-3%	i, k
Nitroso-n-methylethylamine, n-	3.1E-02	2.9E-02	-6%	k
Nitrosomorpholine, n-	1.0E-01	9.6E-02	-4%	k
Nitrosopiperidine, n-	7.1E-02	6.8E-02	-4%	i, k
Nitrosopyrrolidine, n-	3.3E-01	3.0E-01	-9%	i, k
Nitrosodiphenylamine, p-	3.1E+01	2.9E+01	-6%	k
Ozone	NA	7.0E+03	NA	
Pentachlorophenol	3.8E+01	7.7E+00	-80%	g
Perchloroethylene (tetrachloroethylene)	3.3E+01	3.0E+01	-9%	i, k
Phenol	8.7E+03	7.7E+03	-11%	a, b
Phosgene	1.8E+02	NA	NA	
Phosphine	1.9E+03	3.1E+01	-98%	a, c
Phosphoric acid	4.6E+02	2.7E+02	-41%	a, b, d
Phosphorus (white)	1.4E+01	2.7E+00	-81%	a
Phthalic anhydride	1.4E+06	7.7E+02	-99.95%	a, c
PCBs (polychlorinated biphenyls) [low risk]	NA	8.0E-01	NA	
PCBs (polychlorinated biphenyls) [high risk]	6.8E-03	2.8E-02	+312%	e, h
Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) (as 2,3,7,8-PCDD equivalent)	1.2E-06	5.7E-07	-53%	h, k
Polycyclic aromatic hydrocarbon (PAH) (as B(a)P-equivalent)	4.4E-02	1.1E-02	-75%	e, h
naphthalene	2.7E+02	5.3E+00	-98%	i, **
Potassium bromate [see bromine & compounds]				
Propane sultone, 1,3-	2.7E-01	2.7E-01	None	
Propylene (propene)	NA	1.2E+05	NA	
Propylene glycol monomethyl ether	NA	2.7E+05	NA	
Propylene oxide	5.2E+01	4.9E+01	-6%	k
Selenium and compounds	9.7E+01	7.7E+02	+694%	a, b
selenium sulfide	NA	7.7E+02	NA	
Sodium hydroxide	9.3E+02	1.9E+02	-80%	a
Styrene	1.4E+05	3.5E+04	-75%	a, b
Sulfates	NA	9.7E+02	NA	
Sulfuric acid and oleum	NA	3.9E+01	NA	
sulfuric acid	NA	3.9E+01	NA	
oleum	NA	3.9E+01	NA	
Tetrachloroethane, 1,1,2,2-	3.3E+00	3.2E+00	-3%	i, k
Tetrachlorophenols	1.7E+04	3.4E+03	-80%	a
Thioacetamide	1.1E-01	1.0E-01	-9%	k
Toluene	3.9E+04	1.2E+04	-69%	a, b
Toluene diisocyantates	1.8E+01	2.7E+00	-85%	g
toluene-2,4-diisocyanate	1.8E+01	2.7E+00	-85%	g
toluene-2,6-diisocyanate	1.8E+01	2.7E+00	-85%	g
Trichloroethane, 1,1,1- (see methyl chloroform)				

Chemical	Chronic Trigger Levels (pounds/year)		Change from REP[a]	Notes
	REP[a]	Table 2-5-1[b]		
Trichloroethane, 1,1,2- (vinyl trichloride)	1.2E+01	1.1E+01	-8%	k
Trichloroethylene	9.7E+01	9.1E+01	-6%	k
Trichlorophenol, 2,4,6-	9.7E+00	9.1E+00	-6%	k
Triethylamine	NA	7.7E+03	NA	
Urethane (ethyl carbamate)	6.6E-01	6.4E-01	-3%	i, k
Vinyl acetate	NA	7.7E+03	NA	
Vinyl bromide	NA	2.7E+02	NA	
Vinyl chloride (chloroethylene)	2.5E+00	2.4E+00	-4%	k
Vinylidene chloride (1,1-dichloroethylene)	6.2E+03	2.7E+03	-56%	a, b
Xylenes (mixed isomers)	5.8E+04	2.7E+04	-53%	a, b
m-xylene	NA	2.7E+04	NA	
o-xylene	NA	2.7E+04	NA	
p-xylene	NA	2.7E+04	NA	
Zinc and compounds	6.8E+03	1.4E+03	-79%	a
zinc oxide	NA	1.4E+03	NA	

[a] = BAAQMD Air Toxics Risk Evaluation Procedure (REP), Tables 1 and 2 (February 3, 2000)
[b] = BAAQMD Regulation 2, Rule 5 (2005)

Notes (Identify the Basis for Change in Trigger Levels from the REP):

a = Decrease Target Hazard Index from 1.0 to 0.2
b = Increase in REL
c = Decrease in REL
d = REP Trigger Level derived from TLV, Table 2-5-1 Trigger Level derived from REL
e = Decrease in URF
f = REP Trigger Level based on CAAQS, Table 2-5-1 Trigger Level based on CPF
g = REP Trigger Level derived from URF, Table 2-5-1 Trigger Level derived from REL
h = Multi-pathway exposure parameters revised
i = REP Trigger Level derived from URF, Table 2-5-1 Trigger Level derived from CPF
j = REP Trigger Level incorporates an oral CPF; currently, no oral CPF is available
k = Increase in Breathing Rate
l = REP Trigger Level Derived from REL, Table 2-5-1 Trigger Level derived from CPF
* = REP Trigger Level derived from incorrect URF
** = Calculation error in REP Trigger Level

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

STAFF REPORT

JUNE 2005

Appendix D

Proposed BAAQMD Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
939 ELLIS STREET
SAN FRANCISCO, CA 94109

Proposed BAAQMD Air Toxics NSR Program Health Risk Screening Analysis (HRSA) Guidelines

D1. INTRODUCTION

This document describes the Bay Area Air Quality Management District's guidelines for conducting health risk screening analyses. Any health risk screening analysis (HRSA) that is required pursuant to Regulation 2 Permits, Rule 1 General Requirements or Rule 5 New Source Review of Toxic Air Contaminants shall be conducted in accordance with these guidelines.

In accordance with Regulation 2-5-402, these guidelines generally conform to the Health Risk Assessment Guidelines adopted by Cal/EPA's Office of Environmental Health Hazard Assessment (OEHHA) for use in the Air Toxics Hot Spots Program. In addition, these guidelines are in accordance with State risk assessment and risk management policies and guidelines in effect as of January 1, 2005. Through the District's rule development process, these guidelines will periodically be updated to clarify procedures, amend health effects data, or incorporate other revisions to regulatory guidelines.

D2. PROCEDURES

The procedures described below constitute the Regulation 2-5-603 Health Risk Screening Analysis Procedures. Any HRSA shall be completed by following the procedures described in the OEHHA Health Risk Assessment Guidelines for the Air Toxics Hot Spots Program that were adopted by OEHHA on October 3, 2003 and any State risk assessment and risk management policies and guidelines in effect as of January 1, 2005.

The OEHHA Health Risk Assessment Guidelines contain several sections which identify (a) the overall methodology, (b) the exposure assessment assumptions and procedures, and (c) the health effects data (cancer potency factors, chronic reference exposure levels, and acute reference exposure levels).
A summary of OEHHA's Health Risk Assessment Guidelines and an index of the relevant documents are located at:

http://www.oehha.ca.gov/air/hot_spots/index.html

OEHHA's risk assessment methodology is located at:

http://www.oehha.ca.gov/air/risk_assess/index.html

The exposure assessment and stochastic technical support document (Part IV of OEHHA's Risk Assessment Guidelines) is located at:

http://www.oehha.ca.gov/air/exposure_assess/index.html

The cancer potency factors for carcinogenic compounds (Part II of OEHHA's Risk Assessment Guidelines) are located at:

http://www.oehha.ca.gov/air/cancer_guide/hsca2.html

The chronic reference exposure levels (RELs), which are Part III of OEHHA's Risk Assessment Guideline, are located at:

http://www.oehha.ca.gov/air/chronic_rels/index.html

The acute reference exposure levels (RELs), which are Part I of OEHHA's Risk Assessment Guideline, are located at:

http://www.oehha.ca.gov/air/acute_rels/index.html

Sections D2.1 through D2.3 below clarify and highlight some of the exposure assessment procedures including exposure assumptions (e.g., breathing rate and exposure duration) and health effect values to be used for conducting HRSAs.

D2.1 Clarifications of Exposure Assessment Procedures

This section clarifies and highlights some of the exposure assessment procedures that should be followed when conducting an HRSA.

D2.1.1 Breathing Rate

On October 9, 2003, a statewide interim Risk Management Policy for inhalation-based residential cancer risk was adopted by the California Air Resources Board (ARB) and Cal/EPA's OEHHA (http://www.arb.ca.gov/toxics/rmpolicy.pdf). For the HRSA methodology used in the Air Toxics NSR Program, the District has conformed with these State guidelines and adopted the interim exposure assessment recommendations made by ARB and OEHHA. The interim policy recommends where a single cancer risk value for a residential receptor is needed or prudent for risk management decision-making, the potential cancer risk estimate for the inhalation exposure pathway be based on the breathing rate representing the 80th percentile value of the breathing rate range of values (302 L/kg-day).

To assess potential inhalation exposure to offsite workers, OEHHA recommends assuming a breathing rate of 149 L/kg-day. This value corresponds to a 70 kg

worker breathing 1.3 m^3/hour (breathing rate recommended by USEPA as an hourly average for outdoor workers) for an eight-hour day. For children, OEHHA recommends assuming a breathing rate of 581 L/kg-day to assess potential risk via the inhalation exposure pathway. This value represents the upper 95% percentile of daily breathing rates for children.

D2.1.2 Exposure Time and Frequency

Based on OEHHA recommendations, the District will estimate cancer risk to residential receptors assuming exposure occurs 24 hours per day for 350 days per year. For a worker receptor, exposure is assumed to occur 8 hours per day for 245 days per year. However, for some professions (e.g., teachers) a different schedule may be more appropriate. For children at school sites, exposure is assumed to occur 10 hours per day for 180 days (or 36 weeks) per year.

D2.1.3 Exposure Duration

Based on OEHHA recommendations, the District will estimate cancer risk to residential receptors based on a 70-year lifetime exposure. Although 9-year and 30-year exposure scenarios may be presented for information purposes, risk management decisions will be made based on 70-year exposure duration for residential receptors. For worker receptors, risk management decisions will be made based on OEHHA's recommended exposure duration of 40 years. Cancer risk estimates for children at school sites will be calculated based on a 9 year exposure duration.

D2.2 Health Effects Values

Chemical-specific health effects values have been consolidated and are presented in Table 2-5-1 for use in conducting HRSAs. Toxicity criteria summarized in Table 2-5-1 represent health effects values that were adopted by OEHHA/ARB as of January 1, 2005. Prior to use in Regulation 2, Rule 5, any new or revised health effects values adopted by OEHHA/ARB after January 1, 2005 will be reviewed by the District through a rule development process. The District will evaluate the new criteria for implementation, enforcement, and feasibility of compliance with the project risk limits.

D2.3 Stochastic Risk Assessment

For a stochastic, multipathway risk assessment, the potential cancer risk should be reported for the full distribution of exposure from all exposure pathways included in the risk assessment. For risk management decisions, the potential cancer risk from a stochastic, multipathway risk assessment should be based on the 95^{th} percentile cancer risk.

D3. Assessment of Acrolein Emissions

Currently, CARB does not have certified emission factors or an analytical test method for acrolein. Therefore, since the appropriate tools needed to implement and enforce acrolein emission limits are not available, the District will not conduct a HRSA for emissions of acrolein. In addition, due to the significant uncertainty in the derivation, OEHHA is currently re-evaluating the acute REL for acrolein. When the necessary tools are developed, the District will re-evaluate this specific evaluation procedure and the HRSA guidelines will be revised.

References

1 *"Air Toxics "Hot Spots" Program Risk Assessment Guidelines, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, ", OEHHA, August 2003*

2 *"Air Toxics "Hot Spots" Program Risk Assessment Guidelines, Part IV. Technical Support Document for Exposure Assessment and Stochastic Analysis", OEHHA, September 2000*

3 *"Air Toxics "Hot Spots" Program Risk Assessment Guidelines, Part II, Technical Support Document for Describing Available Cancer Potency Factors", OEHHA, updated December, 2002.*

4 *"Air Toxics "Hot Spots" Program Risk Assessment Guidelines, Part III, Technical Support Document for the Determination of Noncancer Chronic Reference Exposure Levels", OEHHA, April 2000.*

5 *"Air Toxics "Hot Spots" Program Risk Assessment Guidelines, Part I, Technical Support Document for the Determination of Acute Reference Exposure Levels for Airborne Toxicants", OEHHA, March 1999.*

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

June 2005

Appendix E

Comments on Proposed Air Toxics NSR Program & BAAQMD Responses

Toxic Evaluation Section

Bay Area Air Quality Management District

E1. INTRODUCTION

In April 2003, the District proposed to codify the policies and procedures that make up the BAAQMD Air Toxics NSR Program by adopting a new District rule: Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants, and a new part to its Manual of Procedures. Amendments to several other District rules were also proposed in order to maintain consistency with Regulation 2, Rule 5. The District conducted a series of public workshops and community meetings during May and June 2003, and continued to accept written comments through July 2003.

The District received numerous comments on the April 2003 proposal. The most extensive comments submitted were from the Golden Gate University School of Law Environmental Law and Justice Clinic (ELJC) on behalf of the Environmental Justice Air Quality Coalition, Bayview Hunters Point Community Advocates, and Our Children's Earth Foundation. The California Council for Environmental and Economic Balance (CCEEB) also submitted detailed comments.

The District's rule development efforts were then delayed for a period of time pending the release of revised risk assessment guidelines and tools from OEHHA and CARB. The District issued a revised proposal in March 2005. The most substantive revision was the removal of provisions for discretionary risk management. Other revisions were relatively minor in impact and clarifying in nature. A workshop on the revised proposal was conducted on April 8, 2005.

The District received several comments about source applicability and permitting procedures from several facility representatives during the final workshop and in written form from CCEEB. Minor written comments, which were not directly related to the proposed amendments, were also received from CARB concerning associated regulations.

In many cases, several different individuals commented on the same issue. To facilitate the discussion of the issues, the District has summarized all of the comments received about each issue and provided a response for each issue. This discussion is presented in Section E2 below. Each commenter is identified in Section E3.

Verbal comments were also received from CARB[1] and OEHHA[2] concerning acrolein; OEHHA has also followed up on their comments by e-mail. CARB has determined that the existing test methods for acrolein are invalid and existing emission factors have great uncertainty. Sources need a valid test method to be able to establish site-specific emission rates that can be used to demonstrate compliance with permit conditions and regulatory standards. Generally, the District uses CARB-approved emission estimating methods for the Air Toxics Hot Spots Program and for the Air Toxics NSR Program. Therefore, until CARB develops a valid test method and adequate testing data are available, the District will not include emission estimates for acrolein in determining risk. In addition, OEHHA is reevaluating the acute REL for acrolein and the methodology for deriving RELs for sensory irritants with mild and temporary effects.

E2. SUMMARY OF COMMENTS AND RESPONSES

The comments on the District's April 2003 proposal covered a broad range of issues. Many comments concerned the District's general approach to regulating air toxic emissions from new and modified sources, while many other comments were about the specific proposed language in the April 2003 draft of Regulation 2, Rule 5. Some additional comments dealt with other proposed regulatory amendments (fees, in particular). Another issue of concern was the District's proposed Negative Declaration for this rule development project pursuant to the California Environmental Quality Act (CEQA). The dry cleaning industry submitted comments concerning the impact to their industry. The District also received a few comments that were not related to this rule development project.

Comments about each of the following major topic areas are discussed in detail in the following sections: the District's Air Toxics NSR Approach, CEQA, Dry Cleaners, and Miscellaneous Unrelated Comments. The comments are presented first, followed by the District's response to each point or issue.

[1] Conversation of Scott Lutz with Dan Donohoue (CARB) concerning faulty test methods for acrolein, ambient concentrations, and OEHHA methodology for establishing RELs. Mr. Donohoue reiterated that CARB's Risk Management Guidelines recommend consideration of permit approval for cases where Hazard Index exceeds 1.0, especially considering the lack of an adequate test method that a facility could used to show compliance. Mr. Donohoue was also concerned that OEHHA's acute REL for acrolein is well below typical ambient levels and was aware of OEHHA's reevaluation of the acute REL for acrolein.

[2] Conversation of Scott Lutz with Melanie Marty (OEHHA) concerning acute REL for acrolein, and methods for establishing RELs. Acrolein is in a group of sensory irritants with mild and temporary health effects for which OEHHA does not recommend regulatory action at a Hazard Index of 1.0. Acute REL for acrolein was established by extrapolating from a 5-minute exposure to a 1-hour concentration; OEHHA is reevaluating this methodology and the value of the acute REL.

E2.1 District's Air Toxic NSR Approach

Best Available Control Technology for Toxic Emissions (TBACT)

Comment:

The TBACT requirement should not be limited to chronic cancer risk and hazard index (HI), but also on the basis of the acute HI. This would provide consistency with the chronic HI threshold for TBACT. Establishing an acute HI threshold of 0.2 for TBACT would provide a concrete way for the District to use a precautionary approach to control TAC emissions.

Response:

The District is unaware of any agency that has established a TBACT requirement based solely on acute HI. The District does not believe that a TBACT requirement based on a maximum acute HI of 0.2 is appropriate for a number of reasons as follows.

1. An acute HI of 0.2 is only twenty percent of the exposure level at which specified health effects might be expected to occur in the general population including sensitive individuals;
2. Most acute RELs are based on health effects that are mild and reversible (e.g., mild irritation of the eyes, nose, or throat). Uncertainties in the available toxicological data also require that most acute RELs incorporate extrapolation factors of 10 or more;
3. Most of the sources that the District permits have continuous or intermittent emissions that result in exposures that are more appropriately characterized as being chronic than acute. For example, OEHHA recommends that acute RELs be used to evaluate exposures that occur no more frequently than every two weeks in a given year. Nearly all TACs with acute RELs also have chronic RELs, and the District has proposed to require TBACT based on a very stringent chronic HI of 0.20. Some TACs with acute RELs may also be required to be controlled with TBACT based on maximum cancer risk exceeding 1 in one million, or BACT based on maximum POC, NPOC, or PM emissions exceeding 10 lb/day;
4. The maximum acute HI is determined based on the maximum one-hour average ambient pollutant concentration predicted using the maximum hourly emission rate of the source being evaluated. The likelihood of an actual adverse acute health effect is also dependent on the frequency and spatial extent under which such peak concentrations may occur, which is not part of the evaluation; and,

5. In many cases, the use of TBACT based solely on an acute HI of 0.20 would not be cost-effective. This may be the case if the peak exposure was limited to only a few hours per year (TBACT is required to reduce emissions during all periods of source operation). Additionally, some very small sources (e.g., small natural gas fired combustion sources) would likely have maximum acute HI's over 0.20 due primarily to very localized ground-level impacts caused by limited dispersion. In these cases, project costs would be increased, District resources would be expended, and permit-processing time would be lengthened, for very little reductions in emissions.

Comment:

The TBACT threshold for noncancer risk should be a 1.0 chronic hazard index as provided in the District's Risk Management Policy. The proposed Rule would change the TBACT chronic hazard index threshold to 0.2, which is overly conservative and unnecessary since OEHHA takes a very conservative approach in the development of RELs.

Response:

The requirement for new and modified sources to use TBACT at a maximum chronic HI of 0.2 is provided in statewide permitting guidelines issued by CARB. Requiring TBACT on sources that may collectively contribute to an adverse impact may mitigate potentially adverse cumulative impacts.

Many of the TACs with relatively low chronic RELs are also carcinogens. For almost all of these, TBACT is required based on a cancer risk that exceeds 1 in one million before it is triggered based on a chronic HI of 0.2. For many of the TACs with higher RELs, BACT will be required based on POC emissions in excess of 10 lb/day. For sources where TBACT is required based only on chronic HI, emissions are expected to be relatively high so that cost effectiveness should be reasonable. Costs may also be mitigated by the proposed change to require TBACT on a source-level basis, rather than on a project-level basis as is required under the existing Risk Management Policy.

Comment:

Consider less toxic alternatives and a "no-risk" alternative when assessing TBACT.

Response:

Chemical/product/process substitutions are generally not within the scope of BACT or TBACT. The District is authorized to limit emissions to assure that new and modified sources will not cause, or contribute significantly to, adverse health effects. The District is not authorized to require the use of specific chemicals, products, or processes.

The particular chemicals, products, or processes a facility uses may be based on a number of considerations such as product/process manufacturing, product performance, product safety, and product liability. District staff has limited qualifications and expertise in these areas.

Less toxic alternatives are more appropriately considered when developing regulatory standards for a particular source category with input from industry experts and the public, rather than on a permit-basis. Rules may limit or even prohibit the emissions of specific TACs, but cannot require the use of any specific alternatives.

Project risk limits, and the cost of TBACT equipment and other environmental regulations, encourage permit applicants to evaluate less toxic alternatives. For example, about 80 percent of new dry cleaning machines in the Bay Area already use less toxic alternatives to Perc.

Cumulative Risk and Environmental Justice

Comment Summary:

Several comments were received concerning the lack of incorporation of cumulative health impacts (from mobile and/or stationary sources) into the risk assessment and risk management process for permitting sources. Commenters indicated that risk management decisions should be made based on cumulative risks, not incremental risks. These commenters believe that incorporation of cumulative risk in the permitting process would address environmental justice concerns regarding equal health protection for communities most affected by air pollution. A specific proposal was given to establish "community risk caps" for all new and existing permitted sources based on the District's proposed project risk limits.

Response:

The District's proposal does not include cumulative risk considerations for two reasons: (1) the needed policies, tools, and databases are currently not available for that purpose, and (2) at this time, there is no evidence that emissions from new and modified sources that meet the proposed project risk limits would cause, or contribute significantly to, adverse cumulative health effects. These issues are addressed in more detail in the following sections.

A. Cumulative Risk Management Policies

To our knowledge, risk limits or goals for overall cumulative exposures to TACs from all sources (existing and proposed), or for cumulative exposures from all non-mobile sources, have not been established in law, nor in regulation or guidance by any agency with the authority to do so. If community risk limits were to be established for multiple facilities, it would be expected that they would be set at higher levels than what has been historically used for judging the significance of individual sources or facilities alone. District staff therefore believe that the suggested community risk caps of 10 in a million cancer risk, and 1.0 for non-cancer HI, for all permitted sources are unrealistically low. District staff does not believe that it is good public policy to establish community risk caps that would prohibit growth in a particular geographic area for any proposed project that would emit TACs without considering the degree to which the proposed project would contribute to risk.

District staff expect that cumulative risk management guidelines will be developed at the State-level (e.g., by CARB) over the next several years. Undoubtedly, these guidelines will be developed through a full public process that will allow input from many diverse stakeholders. The District intends on participating in the development of these guidelines. When finalized, the District will consider whether any recommended cumulative risk limits or goals should be incorporated into the District's Air Toxics NSR Program, and/or whether incremental project risk limits should be revised.

B. Cumulative Risk Assessment Tools

Computer simulation models are the preferred tools for completing cumulative risk assessments over a spatial domain. Air dispersion models are used to estimate air pollutant concentrations and depositions at various receptor locations. Health risk assessment models are then used to calculate public exposures and health risks. Additional tools are typically required for database management, reporting, and mapping.

Cumulative risk assessments may be completed over a variety of spatial scales. For example, EPA and CARB have completed comprehensive regional-scale air toxics modeling studies using the ASPEN model (Assessment System for Population Exposure Nationwide). The SCAQMD has similarly used versions of the regional UAM model (Urban Airshed Model) in their MATES-II study (Multiple Air Toxics Emissions Study) of the South Coast Air Basin. The level of accuracy needed in a regional-scale modeling analysis rarely requires that detailed, precise, model input data be used (e.g., source release parameters are often based on assumed, rather than actual, values). Regional-scale models cannot, however, provide results that are accurate over the relatively small spatial scales (i.e., tens of meters) needed to determine the maximum risks to individuals resulting from local emission sources. Microscale air dispersion models are needed for this purpose.

A variety of air dispersion models are available to estimate pollutant concentrations and depositions on a microscale basis. The EPA's ISC model (Industrial Source Complex) has, for nearly three decades, been the most commonly used general-purpose microscale air dispersion model. The EPA is expected to replace the ISC model, however, with the AERMOD model. AERMOD incorporates improved dispersion estimates using planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. The most recent version of AERMOD also incorporates improved treatment of building downwash.

Cumulative risk assessments that are to be completed in a permitting program, where results must be provided on a timely basis, require an integrated software system that combines dispersion modeling (e.g., using ISC and/or AERMOD), risk assessment modeling, database management, and reporting and mapping functions as seamlessly as possible. For a number of years, CARB has been developing an integrated risk assessment software tool known as HARP (Hotspots Analysis and Reporting Program). HARP can calculate cancer and non-cancer health risks using the new risk assessment guidelines developed by OEHHA. On December 31, 2003, CARB released HARP by posting it on their website. Nevertheless, HARP has a number of limitations and is not designed to be used by air districts for routine permit modeling. CARB is undertaking a process to upgrade HARP to make it more usable for the air districts.

The District has identified a number of critical issues that will need to be resolved before HARP could be used for cumulative risk assessment in the Bay Area:

1. HARP uses a PC-based source and emission inventory database, known as CEIDARS-Lite (California Emission Inventory Development and Reporting System-Lite). The District does not use CEIDARS-Lite, but rather has its own mainframe database developed in-house. Appropriate interface software would need to be developed between the District's database and HARP. The District has estimated the cost of developing such a database interface for HARP to be about $20,000, plus an additional $5,000 per year for software licensing.

2. HARP lacks integrated GIS technology that allow data (i.e., source locations, building parameters, facility boundaries) to be input graphically using digital background maps such as USGS Digital Raster Graphics (DRG) and Digital Orthophoto Quadrangles (DOQ). These GIS features are available on most commercial modeling systems and are currently used by the District to complete health risk screening analyses. The District has estimated the cost of developing integrated GIS technology for HARP to be at least $25,000.

3. HARP uses the ISC dispersion model and will need to be modified to use AERMOD, or it will soon be obsolete. The District has estimated the cost of upgrading HARP to have AERMOD compatibility to be at least $25,000.

The total estimated cost of the necessary software enhancements is at least $70,000, plus $5,000 per year for software licensing. CARB is developing plans to make some of these modifications to HARP.

C. Cumulative Risk Assessment Databases

Detailed source, facility, building, and geophysical data (i.e., land use, meteorology, and terrain data) are needed to complete cumulative risk assessments at a community-level. While geophysical databases are generally already available (e.g., from USGS), source, facility, and building databases are not, and must therefore be created.

Source databases require peak and long-term average emissions for each emitted TAC, information regarding the temporal variation of these emissions, and detailed information regarding how the emissions are released to the atmosphere. In ISC and AERMOD, the emissions from each "emission source" (i.e., permit unit) must be assigned to one or more type of "modeling source" as follows: stack, volume, rectangular area, circular area, polygon area, or open pit. For each modeling source, source coordinates, base elevation, and release height are required. Additional source input requirements are specific to the modeling source type. For example, stack sources require stack temperature, exit velocity or flowrate, and exit diameter.

Required facility data generally consist of a series of coordinates that describe the facility fence line or boundary line. The ISC and AERMOD models also require building information consisting of the coordinates of the corners of any nearby buildings, along with the building height and base elevation. For multi-tiered buildings, the information is required for each building tier. These building parameters are processed into wind direction-specific building dimensions prior to modeling.

The District currently does not have the detailed source, facility, and building databases needed for completing cumulative risk assessments in the Bay Area. Of the parameters listed above, the District's electronic database currently includes only long-term average actual emissions (the database also includes limited stack information, the accuracy of which is suitable only for regional modeling analyses).

Creating a microscale modeling database would require the completion of the following three tasks: (1) Establish the necessary modeling database elements, (2) map the emissions from each permit unit to one or more modeling source, and (3) populate and maintain the modeling database elements. While the first task is relatively straightforward, the second and third would require substantial efforts due to the large number of permitted sources with TAC emissions. If all permitted sources emitting TACs were to be included, information would need to be collected, screened, and entered for roughly 22,500 sources at 12,000 facilities.

The District has made a preliminary estimate of the costs of creating a microscale modeling database for permitted sources of TACs (see Attachment 1). The initial costs are estimated to be roughly $1.2 million (15 staff FTEs). The annual cost of updating and maintaining the modeling database on an ongoing basis is estimated to be at least 10 percent of the cost of the initial database population (i.e., $120,000, or 1.5 staff FTEs per year). These costs represent District staff resources only, and do not include the costs that would be incurred by permitted facilities for assembling the required information and filling out the necessary data forms.

Depending on the desired scope of the cumulative impact analyses, additional emissions inventory data may also need to be compiled. The District's current database contains only long-term actual emissions. Establishing short-term maximum emission rates, and/or maximum permitted emissions (rather than actual emissions) would require additional work. The costs of these additional projects have not been estimated at this time.

D. Existing Information on Cumulative Risks from Multiple Facilities

In order to justify the relatively high costs of incorporating cumulative impact analysis into the Air Toxics NSR Program, the benefits of doing so would need to be clearly established. The answer to the question of whether new and modified sources that comply with the existing incremental risk approach cause, or contribute significantly to, adverse cumulative health effects for individuals in the community obviously depends on how an adverse cumulative health effect is defined.

Admittedly, little additional evidence would be needed if an adverse cumulative health effect were defined using the same risk criteria that are used to judge incremental project risks. As was previously indicated, however, the District believes that cumulative risk limits, if established, would likely be considerably higher (e.g., an order of magnitude or more) than incremental project risk limits. Based on this understanding, Staff does not believe that sources that comply with the existing incremental approach would cause, or contribute significantly to, adverse health effects (e.g., our evaluations have shown that clusters of nearby sources that comply with project risk limits are unlikely to result in maximum cumulative risks that are more than about twice the project risk limits).

Instances where emissions from permitted stationary sources have been found to result in health risks that were significantly elevated above typical background risks (i.e., a toxic "hot spot") were highly localized and caused primarily by the emissions from a single source or facility. This was found to be the case for facilities evaluated by the District under the Air Toxics Hot Spots Program. Another example is the cumulative exposure pilot study conducted by CARB and the San Diego APCD in the Barrio Logan community of San Diego, where very localized elevated risks were attributed to hexavalent chromium emissions from a single facility. Emerging cumulative impact studies are expected to provide additional information on which air pollution sources have significant contributions to adverse health effects.

Although the District's Air Toxics NSR rule proposal does not include cumulative risk considerations, the District plans additional work in this area, including:

- Continue to work (with CARB) to collect and analyze comprehensive air toxics monitoring data at sites located downwind of multiple air pollution sources;
- Continue to track CARB's Community Health Modeling Working Group;
- Participate in the development of cumulative risk management guidelines at the State-level;
- Establish a microscale modeling database structure that is integrated with the existing BAAQMD source database;
- Establish software tools needed to input, extract, and execute cumulative impact assessments for permitted stationary sources; and
- Complete pilot project (CARE Program) involving cumulative impact assessment in a Bay Area neighborhood.

Precautionary Principle

Comment Summary:

Several comments were received suggesting the incorporation of a precautionary principle approach to permitting new and modified sources. Commenters indicated that the standard risk assessment and risk management paradigm is likely to be insufficiently health protective of certain sensitive subpopulations and communities, which could result in environmental injustice. It is thought that the incorporation of a precautionary principle should require businesses and industries that emit TACs to demonstrate that there are no safer, less toxic, alternative technologies or compounds available. If an applicant cannot demonstrate that the proposed application will not lead to cumulative health hazards, then that application should be denied.

Response:

As was mentioned previously, the District is a regulatory agency that does not have the authority to require the use of specific chemicals, products, or processes. Thus, the District cannot require the use of the "least toxic" alternative.

The District believes that many elements of the precautionary principle are built into the proposed Regulation 2, Rule 5. The methods used to estimate health risks are not without uncertainty, but are based on well-established scientific principles, and are intended to err on the side of health protection. The stringent project risk limits are set at levels that the District believes do not warrant more detailed alternatives assessment within the preconstruction permitting process. The District intends on monitoring any workable applications of the precautionary principle that may emerge and serve to further improve the Air Toxics NSR Program.

Risk Limits

Comment:

The District should lower all project risk limits. The proposed project risk limits (i.e., 10 in a million cancer risk, non-cancer Hazard Index (HI) of 1.0) are far less stringent than what is required under federal Clean Air Act Section 112 to protect public health with an ample margin of safety. The proposed project risk limits are consistent with CARB risk management guidelines issued in 1993, but these guidelines are considered outdated. Risks for new or modified projects should be limited to 1 in a million for cancer risk and a chronic and acute HI of 0.2.

Response:

The District's proposed project risk limits were chosen to provide a balanced consideration of protection of public health, technological feasibility, economic reasonableness of risk reduction methods, uncertainties and variability in health risk assessments. To our knowledge, no other air-permitting agency uses project risk limits that are any more stringent than what District staff has proposed.

Based on our experience, it would be virtually impossible for a wide variety of sources that the District routinely permits to meet risk levels of 1 in one million cancer risk and/or non-cancer HI of 0.2, despite the use of TBACT and all other reasonable risk reduction measures. This includes almost all retail gasoline dispensing facilities, perchloroethylene dry cleaners, diesel back-up generators, crematories, furniture refinishing operations, and many gas-fired combustion sources. It should be noted that this problem would not be limited to sources in residential area, as the maximum risk for these sources typically results from exposures to nearby off-site workers. The problem will also become even more pronounced when the exposure assessment assumptions in the new OEHHA risk assessment guidelines are used, as calculated cancer risks for off-site workers will increase by 39 percent from the assumptions currently used (note that, for these facilities, making these changes in exposure assumptions is equivalent to lowering the project cancer risk limit to 7.2 in one million and keeping the existing exposure assumptions). Lowering the project cancer risk limit so significantly could also have the negative effect of delaying projects that involve the replacement of existing sources that may reduce risks (the proposed rule treats replacement sources as entirely new sources).

The District's proposed risk limits are not less stringent than what is required under the federal Clean Air Act (CAA). Section 112 of the CAA does not specify any risk limits, nor otherwise define what risk levels "provide an ample margin of safety to protect public health." Rather, the CAA mandates that EPA make these risk management determinations. (Note that the 1 in a million cancer risk level specified in CAA Section 112(f)(2) is not a mandated level of protection, but rather a trigger point to evaluate whether additional emission reductions are necessary to provide an ample margin of safety to protect public health).

The EPA uses a process for risk management decision-making that is outlined in their 1989 benzene NESHAP. Using this process, the EPA has set health-based emission standards for maximum lifetime cancer risks up to, and somewhat above, 100 in a million. For example, the maximum cancer risk after application of the benzene NESHAP for Coke By-product Recovery Plants was 200 in a million (see 54 *Federal Register* 38044). In the 1990 CAA amendments, Congress affirmed the use of this risk management process by referring to it in CAA Section 112(f)(2)(B). Furthermore, in their 1999 Residual Risk Report to Congress (EPA-453/R-99-001, March 1999) prepared in response to CAA Section 112(f)(1), EPA indicated that it was their intent to continue to use this process in setting residual risk standards.

The EPA has not yet set health-based standards under CAA Section 112 on the basis of non-cancer health effects alone. The EPA has indicated, however, that it is their intention to use a maximum non-cancer HI of 1 as a screening-level to eliminate low-risk source categories from further consideration (see EPA Residual Risk Report). This approach is consistent with the recommendations made by the Presidential/Congressional Commission on Risk Assessment and Risk Management (CRARM) mandated under Section 303 of the 1990 CAA Amendments (see *Framework for Environmental Health Risk Management*, CRARM, 1997). The EPA has indicated that a number of factors will be considered in evaluating non-cancer health risks that do not screen-out, including the amount by which the HI is greater than 1, the uncertainty in the HI, the slope of the dose-response curve, and the number of people exposed.

The District has recently asked CARB to clarify the status of their risk management guidelines to the air districts for new and modified stationary sources of TACs. CARB indicated that they do not consider their 1993 guideline document to be outdated. (It should be noted that, in their more recent risk management guidelines for diesel engines issued in 2000, CARB did not recommend any specific upper-bound limits on risk). The District will consider any future updates to CARB risk management guidelines in subsequent amendments to the Air Toxics NSR Program.

It is important to emphasize that the risk management criteria that have been used by EPA to set health-based emission standards under CAA Section 112, and by CARB in established risk management guidelines, are based on the incremental risks associated with specific regulated stationary sources, and not the cumulative risks resulting from multiple facilities or any other sources of air pollution.

Toxic Trigger Levels

Comment:

CARB is currently fixing errors in HARP. The toxic trigger levels should therefore be revised using the final version of HARP when it is available.

Response:

The trigger levels in Table 2-5-1 have been revised based on HARP 1.0, which was released by CARB on December 31, 2003, and OEHHA's health effects values. In addition, CARB's "Recommended Interim Risk Management Policy for Inhalation-Based Residential Cancer Risk" was incorporated in the calculation of the trigger levels.

Comment:

Why is a deposition velocity of 0.02 m/sec being used to derive the toxic trigger levels? The risk assessment guidelines recommend a value of 0.05 m/sec for "uncontrolled" sources.

Response:

The District has incorporated a deposition velocity of 0.02 m/sec (for controlled sources), instead of 0.05 m/sec (for uncontrolled sources) in the derivation of toxic trigger levels because the majority of projects with PM-based TAC emissions permitted by the District emit predominately PM_{10} or finer, for which a vertical deposition velocity of 0.02 m/sec is more appropriate. This includes almost all fuel combustion sources.

Revised TAC List

Comment:

The District should not limit its Air Toxics New Source Review program to conform only to the CARB Risk Management Guidelines. The District can conform to all of the OEHHA risk assessment guidelines and still maintain its own list of TACs. It is incorrect to assume that including only the selected TACs in the OEHHA list and removing those currently on the TAC list will not result in potentially significant environmental impacts. An assessment of the TACs being removed must each separately be discussed in the initial study and explanation and supporting substantiating evidence must be cited to explain how removing them from the list will in fact not result in less protection to what is now in place. In particular, there is great concern in removing gasoline vapors from the TAC list.

Response:

The District is proposing to update the list of compounds included in the Air Toxics NSR Program to include those TACs with health effect values published in the 2003 HRA Guidelines and those adopted by OEHHA up to January 1, 2005. These values represent the best information currently available concerning the toxicity of chemical compounds based on general population exposures and incorporating an adequate margin of safety. As a result of the updated health effect values published in the 2003 HRA Guidelines, there are compounds that will either be added to or removed from the list of compounds currently included in the risk evaluation procedures.

District staff believes it is important that the program be updated periodically to represent the best current scientific understanding regarding potential health effects, providing an ample margin of safety that accounts for the variable effects that heterogeneous populations may experience and the completeness and quality of available information. A specific procedure has been established in California for making and updating these evaluations of toxicity. The toxicologists and epidemiologists at Cal/EPA OEHHA handle the procedure, which includes a peer review process and approval by the State Scientific Review Panel. As new or updated toxicity values are adopted by OEHHA, they will be periodically added to the list of compounds used in the Air Toxics NSR program.

It is important to note that gasoline vapors will continue to be evaluated based on its specific toxic components (e.g., benzene). Due to the reformulation of gasoline, the available toxicity value for gasoline vapors is currently out of date and not appropriate for use is assessing the current composition of gasoline. Therefore, individual toxic components of gasoline will continue to be evaluated.

Criteria Pollutants

Comment:

The ELJC recommends that the toxic effects of criteria pollutants be considered additively when calculating the Hazard Index, and that 1-hour average concentrations of background criteria pollutants be used in calculating the acute HI for the purposes of facility permitting.

Response:

Carbon monoxide, nitrogen dioxide, and sulfur dioxide are criteria pollutants; they are not defined as Toxic Air Contaminants. These are all already subject to criteria pollutant NSR requirements in Regulation 2, Rule 2. Federal and State ambient air quality standards (AAQS) have been established for each, and the District is in attainment of all of these applicable AAQS.

Table 2-5 includes an emission trigger level for ozone because this criteria pollutant is not covered by Regulation 2, Rule 2 (ozone, however, is not expected to be emitted directly from stationary sources in significant quantities). Many particulate TACs (e.g., diesel PM, lead, hexavalent chromium) are included in Regulation 2, Rule 5, and will be considered in health risk screening. In addition, the District is implementing the CARE Program to further assess air pollution health risks at a community-level. While the focus of the CARE Program is on TACs, further analysis of criteria pollutants will also be included.

E2.2 CEQA

Comment:

Several comments were received regarding CEQA requirements. Some comments indicated that a comprehensive environmental impact report (EIR) should be completed on the proposed rulemaking in order to facilitate the public's understanding of the extent of potentially significant and adverse impacts to human health and the environment, and identify ways in which these impacts could be avoided or mitigated. Under CEQA, a negative declaration is improper if substantial evidence in the record supports a "fair argument" that a significant impact may occur.

Response:

The District re-evaluated the need for a more comprehensive CEQA document, and agrees that an EIR should be completed for this proposed rulemaking. Therefore, a draft EIR was prepared by Environmental Audit, Inc. (April 20, 2005) and is available for review on the District's website (www.baaqmd.gov/pln/ruledev/2-5/2005/0205_drEIR_042005.pdf).

The draft EIR indicates that the District's proposal to require new and modified dry cleaners to meet project risk limits of Regulation 2-5-302, may result in a potentially significant increase of a criteria pollutant (ozone) because many dry cleaners may switch from perchloroethylene (a negligibly reactive organic compound) to less toxic cleaning solvents (i.e., VOCs) that may be precursors to ozone formation. Even though the District proposal is expected to reduce emissions of Perc and other TACs, the potential for this increase in VOC emissions is considered significant under CEQA. No other potentially significant adverse impacts were identified.

E2.3 Dry Cleaners Comments

Comment:

Dry cleaners and the Halogenated Solvents Industry Alliance commented that the proposed rule would require all existing facilities to replace their equipment, which would be an excessive expense for these small businesses.

Response:

Only new or modified sources that emit toxic air contaminants (above trigger levels) are subject to Air Toxics NSR. The District currently permits only about 5 to 10 new Perc dry cleaning machines per year. About 80 percent of new dry cleaning machines use alternative solvents (e.g., high flash-point petroleum solvent), which are not subject to Air Toxics NSR (indeed, most are exempt from permitting requirements). The cost of installing and operating alternative solvent machines is very similar to the cost of installing and operating a Perc machine. Existing Perc dry cleaning machines are subject to a statewide ATCM and the Air Toxics Hot Spots Program.

Comment:

Dry cleaners and the *Halogenated Solvents Industry Alliance* commented that the proposal would extend "new source review" limits to existing cleaners wishing to replace their equipment.

Response:

The existing Air Toxics NSR program already treats replacement equipment as a new source. Our permit rules (Regulations 2-1 and 2-2) and Risk Management Policy (RMP) consider replacement machines (e.g., boilers, vapor degreasers) to be new sources [note the exemption, Regulation 1-115: mandated installations/modifications are not subject to new source requirements. The dry cleaning ATCM mandated some dry cleaning facilities to replace or modify vented and transfer machines effective 1998, these replacements were not subject to NSR]. From 1993 to 2000, the District's RMP allowed a replacement dry cleaning machine to be approved if TBACT was applied but risk reduction measures were not required if the throughput was not increased. The District modified the Risk Management Policy on February 3, 2000; the new RMP requires TBACT if project risk is greater than one in a million, and risk reduction measures (e.g., Vapor Barrier Room) if the project risk is greater than 10 in a million (limits risk to 100 in a million).

Comment:

Dry cleaners objected that the District was proposing a future prohibition of Perc dry cleaning. Other commenters (e.g., ELJC) suggested a prohibition of Perc.

Response:

The District's current proposal does not set a future prohibition for Perc; however, CARB is reviewing the statewide dry cleaning ATCM and future prohibition of Perc is possible. This issue is probably more appropriately addressed when the District reviews the forthcoming ATCM revision and could at that time consider changes to Regulation 11, Rule 16.

Comment:

Dry cleaners commented that the industry could not sustain additional annual fees and that the small business discount should be expanded.

Response:

The increase in fees associated with Air Toxics NSR (Risk Screening Fee) is related only to those permit applications for new or modified sources subject to toxic review (with emissions in excess of the trigger levels in Table 2-5-1). The Risk Screening Fee would be increased $272 ($186 with 50% discount for small businesses). Increases in fees (including changes to Fee Schedules that affect annual renewal fees) are included as part of a Public Hearing to consider changes to Regulation 3 to provide revenue for the District's FY 2005/06 budget. The proposed changes to Regulation 3 include expanding the small business income limit from $500,000 to $600,000.

Comment:

Dry cleaners believe that significant emission reductions already achieved by their industry are enough.

Response:

District Staff commends the dry cleaning industry for the emission reductions achieved to date. However, because of the close proximity to residences and off-site workers, the risk from a typical Perc dry cleaner is between 10 in a million and 100 in a million. Virtually all other toxic sources are below 10 in a million.

Comment:

How are risks calculated? Can new dry cleaning machines use Perc?

Response:

The District uses a computer simulation program to conduct air dispersion modeling that estimates concentrations of air pollutants at multiple sites downwind of toxic sources. A program called ISCST3 (Industrial Source Complex Short Term, version 3) that was developed by U.S. EPA is typically used. EPA is developing an improved dispersion model called AERMOD (American Meteorological Society / Environmental Protection Agency Regulatory Model) that will use more site-specific data to estimate dispersion. CARB has developed a new computer program called HARP (Hot Sports Analysis and Reporting Program) that incorporates ISCST3, as well as relevant toxicity values to calculate risk. These new tools and the new OEHHA risk assessment guidelines add significant complexity to the current procedures and will require additional resources.

New dry cleaning machines may still use Perc but, in order to meet the proposed cancer risk standard of 10 in a million, a new Perc machine will likely need to be installed inside a Vapor Barrier Room. VBRs typically cost $5000 to $10,000 to install. Even with a VBR, the amount of solvent allowed may be less than 100 gallons. Facilities should definitely consider alternative solvents.

Comment:

Dry cleaners commented that the rule should not be rushed.

Response:

The District does not believe that the rule is being rushed. The District adjusted the rule development schedule to address the extensive comments received in 2003 and 2004. District staff also thought it appropriate to include the new OEHHA Risk Assessment guidelines and use HARP, which were completed late in 2003 (although HARP still has severe limitations for use as a permitting tool). CARB is proceeding to improve HARP. In addition, the District initiated the Community Air Risk Evaluation (CARE) Program in order to assess cumulative impacts from mobile, area, and stationary sources within a community.

Comment:

Halogenated Solvents Industry Alliance commented that replacement of Perc would likely result in an increase in emissions of ozone-forming (POCs) or toxic alternatives.

Response:

The District considers the increase in emissions of ozone-forming emissions a wise trade-off for the beneficial decrease in Perc emissions. All available data indicate that the alternatives to Perc have lower toxicity than Perc. If OEHHA develops health effects values for any alternative solvent, the District will incorporate that compound into the rule, and the use of an alternative solvent above its trigger level will be subject to toxic new source review.

E2.4 Miscellaneous Comments

Comment:

Section 112 of the Clean Air Act requires risk standards to be set without regard for cost considerations, in order to provide an ample margin of safety to the affected community.

Response:

The federal CAA Section 112 does not restrict EPA from considering the costs of controls in establishing "an ample margin of safety to protect public health". EPA considers costs, and other relevant factors such as technological feasibility and uncertainties, in establishing "an ample margin of safety." The framework for EPA's risk management process is based on the recommendations from a U.S. Court of Appeals decision on the vinyl chloride NESHAP litigation (see *Natural Resources Defense Council v. EPA*, 1987), and is delineated in the preamble to the benzene NESHAP (54 FR 38044, Sept. 14, 1989). EPA briefly describes this risk management process as follows:

> For public health risk management decision-making in the residual risk program, EPA considers the two-step process culminating with an "ample margin of safety" determination, as established in the 1989 benzene NESHAP and endorsed by Congress in the 1990 CAA Amendments as a reasonable approach. In the first step, a "safe" or "acceptable risk" level is established considering all health information including risk estimation uncertainty. As stated in the preamble to the rule for benzene, which is a linear carcinogen (i.e., a carcinogen for which cancer risk is believed or assumed to vary linearly with exposure), "an MIR (maximum individual risk) of approximately 1 in 10 thousand should ordinarily be the upper-end of the range of acceptability." In the second step, an emission standard is set that provides an "ample margin of safety" to protect public health, considering all health information including the number of persons at risk levels higher than approximately 1 in 1 million, as well as other relevant factors including costs, economic impacts, technological feasibility, and any other relevant factors. In notifying the public of the 1989 benzene NESHAP, the Agency stated that it "strives to provide maximum feasible protection against risks to health from hazardous air pollutants by (1) protecting the greatest number of persons possible to an individual lifetime risk level no higher than approximately 1 in 1 million and (2) limiting to no higher than approximately 1 in 10 thousand the estimated risk that a person living near a plant would have." (Source: Residual Risk Report to Congress, EPA-453/R-99-01, March 1999, pg. ES-11).

The risk management process used by CARB is similar to that used by EPA. CARB recommends an upper level maximum project cancer risk of 100 in a million, and a non-cancer HI of 10. Acceptable risks below that level are then based on case-by-case considerations of a broad range of factors including the degree of uncertainty in the risk analysis, and the technological feasibility and cost effectiveness of risk reduction measures.

Comment:

The proposed changes do not result in more stringent NSR regulations but instead may result in less stringent regulatory controls since some TACs are proposed to be removed from the current list of TACs. It is the District's responsibility to show that the proposed new rule does not weaken the regulations thereby causing greater public health risk.

Response:

The proposed changes make the program more stringent. The District proposal drops compounds that are not on the OEHHA list, but adds twice as many compounds as are dropped. In addition, though gasoline vapors are dropped, the compounds that make gasoline toxic are retained. Because, in general, the compounds added are more toxic than those dropped, and because there are more added than dropped, the proposal is more stringent than the existing program. It is important that the Toxics NSR program be updated periodically to incorporate the best current scientific understanding regarding potential health effects and provide an ample margin of safety. A specific procedure has been established in California for developing and updating these evaluations of toxicity. The toxicologists and epidemiologists at OEHHA handle the procedure, which includes a peer review process and approval by the State Scientific Review Panel. As updated toxicity values are adopted by OEHHA, the District will periodically consider their addition to the Toxics NSR Program. Prior to use in Regulation 2, Rule 5, any new or revised health effects values adopted by OEHHA/CARB after January 1, 2005 will be reviewed by the District through a rule development process. The District will evaluate the new criteria for implementation, enforcement, and feasibility of compliance with the project risk limits.

Attachment 1: Preliminary Resource Estimate for Populating Modeling Database for BAAQMD Permitted Sources of Toxic Air Contaminants

1. Number of BAAQMD permitted sources and facilities with TAC emissions

As is detailed in the following table, there are currently a total of 22,494 permitted sources of TACs (permit units) in the Bay Area. The number of facilities is 12,032. These figures include an estimated 3,000 backup engines at 2,500 facilities that have not yet received District permits.

BAAQMD Permitted Sources with Toxic Air Contaminant Emissions

Source Category	Number of Sources (Current)	Number of Sources (Future)	Number of Sources (Total)
Gasoline dispensing facilities	2,608	295	2,903
Diesel engines	3,761	3,237	6,998
Crematories	82	0	82
Other combustion sources	3,280	315	3,595
Semiconductor fabrication	157	6	163
Auto body shops	1,095	14	1,109
Other surface coating sources	1,994	37	2,031
Printing presses	871	10	881
Fiberglass operations	76	0	76
PERC drycleaners	714	6	720
Non-PERC drycleaners	203	2	205
Solvent cleaning operations	1,734	40	1,774
Other solvent sources	344	9	353
Organic liquid storage sources	711	15	726
Organic liquid handling sources	107	2	109
Other sources	766	1	767
Totals	18,503	3989	**22,492**

- Current sources are existing sources with a Permit to Operate
- Future sources are sources with an Authority to Construct that have not yet started up
- The number of future diesel engines includes an estimated 3,000 existing sources that have not yet submitted permit applications

2. Staff Time Needed to Collect, Screen, and Enter Modeling Data

The estimated District staff time needed to collect, screen, and enter required modeling data for each source and facility (on average) is given in the following two tables.

Staff Time to Establish Modeling Data for Each Source (min.)

Task	Clerical	Technician	Engineer
Send out source data form	5		
Receive source data form	5		
QA source data form		15	
Establish permitted-to-modeled source relationship			5
Enter source data form(s)			10
Totals per source	10	15	15

Staff Time to Establish Modeling Data for Each Facility (min.)

Task	Clerical	Technician	Engineer
Receive facility boundary and building data diagram	5		
QA facility boundary and building data diagram		15	
Establish background photo/map			15
Enter facility boundary and building data			25
Totals per facility	5	15	40

The estimated staff time needed to establish the required modeling data for all Bay Area sources and facilities identified in item #1 above is summarized as follows.

Total Staff Time to Establish

Modeling Data for All Sources and Facilities (hours)

Task	Clerical	Technician	Engineer
All source data	3,749	5,623	5,623
All facility data	1,003	3,008	8,021
Total for all data	4,752	8,631	13,644

3. District Staff Resources and Associated Costs

The unit cost of District staff labor is given in the following table, based on District FY 2003-04 wages, and including a multiplying factor of 1.285 to account for the cost of overhead incurred above regular wages.

Cost of District Staff Time (Dollars per hour)

	Clerical	Technician	Engineer
Cost of Staff Time w/Overhead	25.85	40.10	51.17

The total cost of the District staff time given in item #2 above is provided in the following table.

Cost to Establish Modeling Data for All Sources and Facilities (Dollars)

Task	Clerical	Technician	Engineer	All
Cost for all source data	$96,903	$225,482	$287,729	$610,114
Cost for all facility data	$25,919	$120,621	$410,452	$556,992
Total cost for all data	$122,822	$346,103	$698,181	$1,167,106

The estimated staff time given in item #2 above is translated into staff resources expressed as full time equivalents (FTEs) in the following table assuming 1,800 staff hours equals 1 FTE.

Staff Resources to Establish Modeling Data (FTEs)

Task	Clerical	Technician	Engineer	ALL
Staff FTEs for all source data	2.08	3.12	3.12	8.32
Staff FTEs for all facility data	0.56	1.67	4.46	6.69
Total FTEs for all data	2.64	4.79	7.58	15.01

E3. LIST OF COMMENTORS

Commenter	Affiliation
Linda Weiner	**Bay Area Clean Air Task Force c/o American Lung Association of San Francisco & San Mateo Counties)** 2171 Junipero Serra Blvd., Suite 720 Daly City, CA 94014-1999 650-994-5864
Michelle Komlenic	**California Air Resources Board (CARB)** P.O. Box 2815 Sacramento, CA 95812 [comments received via telephone conversation with B. Bateman] 916-322-3926
Sally Rump	**California Air Resources Board (CARB)** P.O. Box 2815 Sacramento, CA 95812 916-327-5603
Sandra Giarde	**California Cleaners Association** 530 Bercut Drive, Suite G Sacramento, CA 95814 916-443-0986
Cindy K. Tuck	**California Council for Environmental and Economic Balance (CCEEB)** 100 Spear Street, Suite 805 San Francisco, CA 94105-1525 415-512-7890

Melanie Marty	**California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA)** 1515 Clay Street, 16th Floor Oakland, CA 94612 510-622-3150
Lenore Griffin	**Carlmont Village Cleaners** 101 Alameda De Las Pulgas Belmont, CA 94002 650-593-1121
Summary Report from BAAQMD's Air Toxics NSR Program Workshops	**Design, Community & Environment** 1600 Shattuck Avenue, Suite 222 Berkeley, CA 94709 510-848-3815
Ken Kloc & Amy S. Cohen	**Golden Gate University** **Environmental Law and Justice Clinic** **School of Law** 536 Mission Street San Francisco, CA 94105-2968 415-442-6647
Stephen P. Risotto	**Halogenated Solvents Industry Alliance, Inc. (HSIA)** 1300 Wilson Boulevard Arlington, VA 22209 703-741-5780

Jon Meijer	**International Fabricare Institute** 12251 Tech Road Silver Spring, MD 20904 301-662-1900
Edward Moore	**New United Motor Manufacturing, Inc. (NUMMI)** 45500 Fremont Blvd. Fremont, CA 94538 510-498-5795
Marti Russell	**Peninsula Dry Cleaners Association (PDCA)** 1876 S. Norfolk San Mateo, CA 94403
Heather N. Perry	**Stanford University** Environmental Health and Safety ESF – 480 Oak Road Stanford, CA 94305-8007 650-723-0448
Antoinette “Toni” Stein	**Antoinette “Toni” Stein, PhD** 800 Magnolia Street Menlo Park, CA 94025 650-853-0314 igc.org [tweil@igc.org]
David Schonbrunn	**Transportation Solutions Defense and Education Fund (TRANSDEF)** 16 Monte Cimas Avenue Mill Valley, CA 94941 415-380-8600